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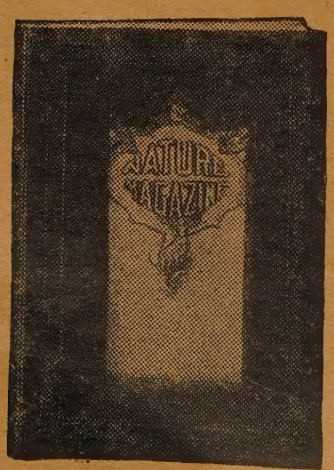


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## Nature Study Meeting

Members of the American Nature Study Society will hold their forty-second annual meeting in Boston on December 27 and 28, with headquarters at the Bradford Hotel. The morning session on the first day will consider as a subject: "How to increase natural resource planning and conservation education in our school programs through present subject matter areas." At the afternoon session the subject is: "The Workshop method in training teachers and leaders in conservation and planning programs in conservation." Saturday morning will consist of two sessions, one considering New England's nature and conservation plans and programs, and the other the organization of the fourteen southern states for resource use education through the Southern Resources Committee. The final session, Saturday afternoon, will consider the improvement of camping education through greater use of natural resources.

## Science Serves

*Serving through Science* is the title of a booklet into which have been gathered discussions of recent science developments by outstanding scientists delivered in the course of the New York Philharmonic-Symphony radio concerts sponsored by the United States Rubber Company. This collection of brief talks is of particular interest to science teachers, and the book is made available by the U. S. Rubber Company through The National Science Teachers Association, 1201 16th Street, N.W., Washington 6, D. C. Also, additional copies of individual talks may be had on request.

## Greenhouses

*Greenhouses: Their Construction and Equipment.* By W. J. Wright. New York. 1946. Orange Judd Publishing Company. 269 pages. Illustrated. $2.50.

This is a third and largely rewritten edition of a practical manual on greenhouses, first published in 1917. As such, this useful book takes into account progress in greenhouse management, principally in the direction of devices employing electric power and providing automatic control. The title is amply descriptive of the contents of the book, which is of interest to anyone constructing a greenhouse for commercial purposes, or for one's own home use.

## Trees, Shrubs, Vines

*The Encyclopedia of Trees, Shrubs, Vines and Lawns for the Home Garden.* By Albert E. Wilkinson, Philadelphia. 1946. The New Home Library. 486 pages. Illustrations by Tabea Hofmann. $1.00.

Few book titles are as descriptive of the contents of the volume as is the case with this useful book, which will find a place in many garden libraries. In the first part of the book the trees, shrubs, or vines are arranged alphabetically, and descriptions and cultural instructions are provided. In the second part of the book general gardening problems are discussed; the place of trees, shrubs, vines and lawns in the garden plan are considered; the making and care of the lawn are outlined. Soils, fertilizers, insect pests and their control, diseases, propagation are considered, and about every question that might arise is answered. This is a valuable and practical book, and certainly a bargain.

## Park Trees Inviolate

Rumors have been circulating that the National Park Service has agreed to a new policy that would permit cutting of timber on park lands. This J. A. Krug, Secretary of the Interior, flatly denies, saying:

"The national policy of maintaining national park forests inviolate, established by law, has been strengthened by general public acceptance of it over the long period since the Congress began giving park status to nationally significant scenic areas of this country. Only in the parks will Americans of the present and future be assured of an opportunity to see and savor the majesty and the beauty of the natural forest and to observe the natural processes which produce and affect the forest community."

Secretary Krug asserted that no present or forseeable contingency justifies the harvesting of park timber. He pointed out that any existent shortage of lumber is not due to any shortage of standing timber on non-park lands, but to a variety of other causes.

## Shade Treemen Elect

Charles F. Irish is the new president of the National Shade Tree Conference, marking the first time that a commercial arborist has been chosen for this office. Mr. Irish has for many years been in charge of the famous Cathedral Elms of Bratenahl Village's Lake Shore Boulevard, Cleveland. He has been in charge of several notable plantings, including the trees at Nela Park. Mr. Irish is also the inventor of several tree movers and has worked out special techniques in this field.

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# Nature in Print

*By* HOWARD ZAHNISER

E. ADAMS DAVIS—a teacher of American History and a folklorist who has recently collected and retold legends from the Valley of Mexico—once said to "an old one" in the Plaza de Santo Domingo: "*Maestro,* from whence come all these stories and legends which you have told me?"

"'Ah, *Senor,*' he replied, as he languidly drew deeply from his *puro* and gazed with soft, dreamy, though searching eyes up at the swirling cloud formations, 'that is a question which even I cannot answer, for I do not know. Perhaps they are of the night wind's telling.'"

Professor Davis adds: "Perhaps they are." And he is impressed enough with the appropriateness of the explanation to entitle his collection *Of the Night Wind's Telling.* Nor is it an unhappy choice, for the legends of this volume—although solid in content and undoubtedly based on a sound scholarship—are lightly told for the most part, and our historian-author, on a holiday, has apparently eschewed any too-serious purpose. Andres Horcasitas, a Mexican official who has written a foreword for the volume, does see in it a promotion of better understanding between the peoples of the United States and Mexico, but the author himself debonairly tells us of how he resisted even his publisher's suggestion that the book would profit by bibliographical completeness and some detail in folklorist explanations. Nevertheless, *Of the Night Wind's Telling* is no collection of stories for children (at least not our children) but rather a work for adults who are interested not only in good stories but in the peoples who tell them. Only a small part of the volume is devoted to myths of Nature, and these are recorded in a comparatively prosaic manner rather than recreated with enthusiasm. It is when Professor Adams is telling legends with such titles as "The Phantom Guard," "The Sad Indian," and "Avenging Skeleton" that he communicates his flair as well as his theme, and his book will leave at least some readers wishing that he might have thus told more of the old Mexican Valley legends that deal with the world of Nature.

But no one this season should have any complaint about lacking a good new book of Nature stories, for Ivan T. Sanderson has prepared as entertaining, delightful, and satisfying a volume as we have seen—a handsomely published collection entitled *Animal Tales: An Anthology of Animal Literature of All Countries.* Here are thirty superb tales, with their settings in as many geographical regions, plus an engagingly significant first tale of Mr. Sanderson's own telling. Here are samples (complete in themselves) from the writings of the best animal-tale tellers we have known, and some we have not known before but welcome heartily—including surprises in both groups. Sir Percy Fitzpatrick is here, for example, with an excerpt from *Jock of the Bushveld*—a favorite in our household ever since years ago a copy found its way to us from Africa through the agency of one of ours who was a missionary in more ways than one. Yet anyone who has combed bookstores for this volume for fifteen years, with only two catches, can certainly testify to both delight and surprise in finding it in Mr. Sanderson's collection labeled as a "famous classic" (thanks apparently to his own English rearing). On the other hand, how could one who has been diligent in a quest in this field of literature in America have missed through all these years (apparently in front of his very eyes) the "objective realistic fiction" of Clarence Hawkes? It is certainly a welcome anthology that can thus so well represent old favorites and at the same time reveal new ones readily available.

It is not enough, however, to be thankful here for thirty tales. The edge of gratitude is sharpened further by the fact that these tales concern as many different animal heroes, and it becomes keen indeed when one senses the nicety of Mr. Sanderson in seeing that each comes from a different "animal country"—all cleverly defined and represented in the volume's end-paper maps.

So much for the tales themselves, and the anthologist's services in their selection! And as much of praise can be said for the introductory pages that Mr. Sanderson has prepared, and the striking illustrations from his brush paintings. For in these introductions there is not only charming description of the world's thirty "animal countries", but, also, biographical interpretation of thirty writers of animal tales. One can thus in this volume delightfully survey the geography of natural history and a large part of its literary biography—as well as enjoy a plenty of good tales.

Finally, for many readers this volume will have a rich literary satisfaction because of Mr. Sanderson's foreword and his introductory chapter entitled "The Animal Tale: A History and Analysis." Animal writings, he points out, "have never been recognized as a distinct type of literary exposition," and yet "it is a branch of letters that warrants more profound analysis and a much wider appreciation." Mr. Sanderson has attempted the one and encouraged the other, and after reading his essay one is certainly disposed to agree with him that "if the attention had been paid to the animal tale that has been bestowed upon, for instance, the eighteenth-century novel, the precepts that govern our world might now well be visibly better." And the room for improvement is ample.

Including both fact and fiction in his category of animal tales, Mr. Sanderson classifies them all into eight groups—all represented in his collection and each selection labeled—scientific observations, natural history, sympathetic anecdotes, antipathetic anecdotes, subjective realistic fiction, objective realistic fiction, possible fantastic fiction, and impossible fantastic fiction. One follows his exposition of these distinctions with tense interest, and feels that an understanding of animal tales as literature has, as a result, been enriched and an appreciation of them heightened. Mr. Sanderson's arbitrary terminology, requiring his own explanations, may cause some hesitation. A story told from the animal's point of view, for example, is labeled "objective"; told from the reader's viewpoint or "from the human angle" is subjective. Fiction is fantastic if the animals talk, and this characteristic alone merits this label. But until someone else discovers more appropriate descriptions we can be content to appreciate without fault-finding this brilliant and revealing exposition of a literary form heretofore neglected by students.

Having thus devoted this review throughout to a hearty recommendation, it remains only to let the author speak for himself in a quotation and to suggest a broad significance of his interests. The first two paragraphs of the book are as follows:

"The opportunity to compile an anthology of animal literature came as an invitation to leave the world that we know

# Forest Episode

*By* DANIEL SMYTHE

In the grass there was a sudden sound:
It was the katydid—and where
We heard this sawing in the air,
A passing bluejay bunched its blue-sky wings
And dropped upon the ground.
We startled him; he could not stop
The lifting cry, but, with an angry note,
He swung into the top
Of the near pines, their needled sheltering cave.
If we had not passed by,
It would have gone:
This throbbing and exultant wave
Of rhythm that pressed on and on,
A vibrant message to the wind and sky.

and to journey into lands of infinite beauty and mystery. To speak in disparagement of the law of the jungle is not merely foolish, it is clear evidence of ignorance of many kinds, for there is nothing less cruel or more perfect than the polity of nature and there are no more law-abiding citizens than the denizens of the wild, be it jungle, plain, or ice-floe. Rather is it the laws of men and the world that they have created for themselves that should be deprecated. What germ of insanity is it that man picked up in the dim ages of prehistory and which prompts him to perform endless acts of stupidity never listed in the catalogue of objectives laid down for him by nature? Why is it that the picture of animal life, if truthfully and faithfully portrayed, is blemished only by the advent of man, and marred, it seems, in direct proportion to the degree of so-called civilization introduced by the human wretch.

"These are sad thoughts but nonetheless specters that haunt anyone who would gather together a collection of animal tales. The compilation of the present volume was in no wise exceptional in this respect, though it is sincerely hoped that the beastliness of humanity has been held at a minimum and its more worthwhile qualities coaxed into the overall picture. In fact, it has been my guiding principle in the selection of material to choose tales that—having fulfilled the stipulated qualifications as to locale, literary form, the animal hero, and aesthetic charm—should display as little of man as possible."

The opportunity to continue the reading of this volume comes also as an invitation to beauty and mystery—and to good entertainment, as well.

*Of the Night Wind's Telling: Legends from the Valley of Mexico.* By E. Adams Davis. Norman: University of Oklahoma Press. 1946. 276 pp., with foreword by Andres Horcasitas, note on methods and materials with selected list of sources, 2 maps, and 18 full-page drawings by Dorothy Kirk. $3.

*Animal Tales: An Anthology of Animal Literature of All Countries.* Compiled and annotated by Ivan T. Sanderson. New York: Alfred A. Knopf. 1946. 511 pp. with 31 full-page illustrations from brush paintings by Mr. Sanderson, plus end-paper map and index. $5.

## Nature Nonsense

*The Natural History of Nonsense.* By Bergen Evans. New York. 1946. Alfred A. Knopf. 275 pages. $3.00.

Bergen Evans, a professor in the English department at Northwestern University, is a recruiting officer for "the gay cause of common sense." This book is his means of recruitment, and it is as entertaining, valuable and as needed an assault upon nonsensical Nature notions, stubbornly held by a large number of people, as one could hope to find. Scarcely a day passes that we do not hear, in ordinary conversation, some reference to these accepted and ingrained fallacies; or do not see evidence of them through individual actions. Many of these convictions, superstitions, items of misinformation, fears, and fables will be surrendered grudgingly, we have no doubt, but when Professor Evans gets through with them they must certainly be surrendered. But he debunks these traditionally accepted garblings of fact with such good humor and such good writing that only the most hidebound will resent the shattering of illusion. As the publishers say, this is a sort of "Believe it or Not" in reverse. It is delightful.

R. W. W.

## Golden Encyclopedia

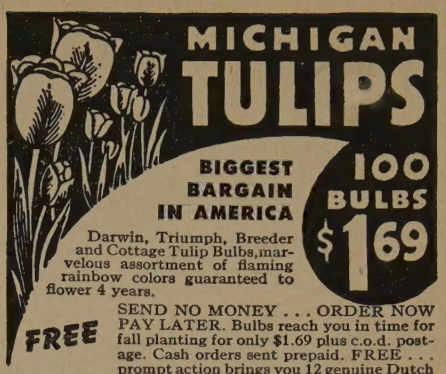
*The Golden Encyclopedia.* By Dorothy A. Bennett. New York. 1946. Simon and Schuster. 126 pages. Illustrated in color and black and white by Cornelius deWitt. $2.50.

This is the latest addition to The Golden Library, and is one of the volumes in that library to which is given the adjective "giant," deriving from the size of the book, which is 10¼ by 13 inches. We were much impressed by this book because it is the first nugget from this literary mine that has come to our attention, although we note that one of the other nuggets is entitled "Animal Stories," and that there are others with a Nature connection. Be that as it may, this encyclopedia, directed to a young audience, is an extremely interesting and useful book. The publishers assure us—and we have no reason to doubt their word—that some 1500 items are illustrated in full color, and 600 more in black and white. The range of information covers animals, plants, airplanes, trains, jewels, games, boats, bridges, food, houses, stars, Indians and a lot of other things. The text is splendidly done, and author and illustrator appear to have collaborated closely to produce a book that is excitingly instructive and alluring. Miss Bennett was formerly an assistant curator at the American Museum of Natural History, and her handling of the natural history in this book is truly a credit to her scientific alma mater. We wish we had had books like this when we were a youngster.

R. W. W.

## Cornell Leaflet

"Outdoor Education" is the title of the September, 1946, Cornell Rural School Leaflet, which marks the start of the fortieth volume in this valuable series. This is a number for teachers and supplies keys to the use of the outdoors as a classroom, enabling the teacher to get the maximum out of real experiences in the open.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### Silviculture

*Practice of Silviculture.* By Ralph C. Hawley. New York. 1946. John Wiley and Sons. 354 pages. $4.00.

Eight years have passed since the fourth edition of this standard textbook on silviculture was published, and 25 years since it first appeared. Both in the quarter of a century, and in the past eight years, much progress has been made toward a better understanding of the principles of silviculture as they apply to the forests of North America. This fifth and revised edition takes account of this progress and brings this important text up to date.

### About the Middle East

*Middle East Science.* By E. B. Worthington. 239 pages with illustration and end map. $2.15. *The Agricultural Development of the Middle East.* By B. A. Keen. 126 pages, with illustration and end map. $1.50. *Rural Education and Welfare in the Middle East.* By H. B. Allen. 24 pages with end map. $.45. All available from British Information Services, 30 Rockefeller Plaza, New York 20, New York.

The titles of these three publications are in themselves descriptive of their contents. Of particular interest to Nature Magazine readers is *Middle East Science,* which is the first attempt at an objective study of the various scientific factors affecting the problems and resources of the Middle East in subjects other than agriculture. All three of the books are enlightening to anyone seeking to understand the serious social and economic, not to mention political, issues of this region. And all three indicate again how basic natural resources are to the superstructure of human social, economic and political existence.

## DOUGHNUT COLLAR

*By* Geraldine Farrar

One day when I threw my offering of bread to the doves and sparrows in the yard there was a doughnut with it. As it landed among them they eyed it timidly, all but one bird giving it a wide berth. This dove, braver or more curious than the others, walked around it two or three times, eyeing it intently. Then, stretching his neck its full length, he gave the doughnut a hard peck. Whereupon it flipped up and settled neatly around his neck. He was the most surprised and startled bird I ever saw. As he hopped about in circle, trying to shake off his annoying collar, the other birds fluttered around eyeing him inquisitively. This went on for twenty minutes, until, finally, the soft rain wet the doughnut and it fell apart, landing at the feet of the now distracted wearer. With an angry flip of his tail he pounced upon it cutting it to pieces with his beak and claws.

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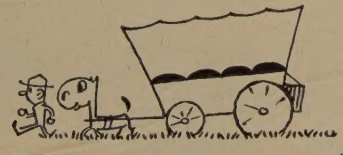
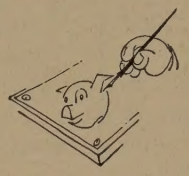
# Contents Noted

PROBABLY a December issue of this magazine should be heavily weighted with articles about Christmas trees, mistletoe, poinsettia, turkeys, reindeer; should have a holly wreath on its cover. We have printed all such editorially obvious features in the past, and can scarcely keep on doing them, year after year, in different words. Besides, Christmas is a man-made festival, originally holy in intent but now confused with overtones of commercialization. In the world of Nature it is just another day, perhaps a difficult one in the struggle for existence. So we will put flamingos in the cover, in a sort of secret envy for those who live in climes so warm that they can enjoy these birds on Christmas, and let Alan Devoe convey our Yuletide message, which he does, more eloquently than we could do, elsewhere in these pages. But because we like that part of Christmas that begets a friendly feeling, we will say a simple Merry Christmas, and voice the hope that 1947 will see us move closer to peace on earth, good will toward all men.

FROM the Republic of Ecuador comes an announcement that 125,000 acres of "rich and potentially productive, but uncleared land in the Santo Domingo de los Colorado area" are now available to acceptable North American and British settlers. Each adult settler may obtain 50 hectares—which translates into about 124 acres—free save for modest "commission-transfer" charges. The soil is said to test as well as that of Java, which rates very highly. There appears to be plenty of water and timber. Settlers will be allowed to bring in personal effects and agricultural equipment free of duty. We pass this information on because it seems to indicate a limited but a new bit of frontier; a place where the pioneer may still start from scratch. Anyone with a covered-wagon urge can get more information from Dr. J. M. Sheppard, Casilla 315, Quito, Ecuador.



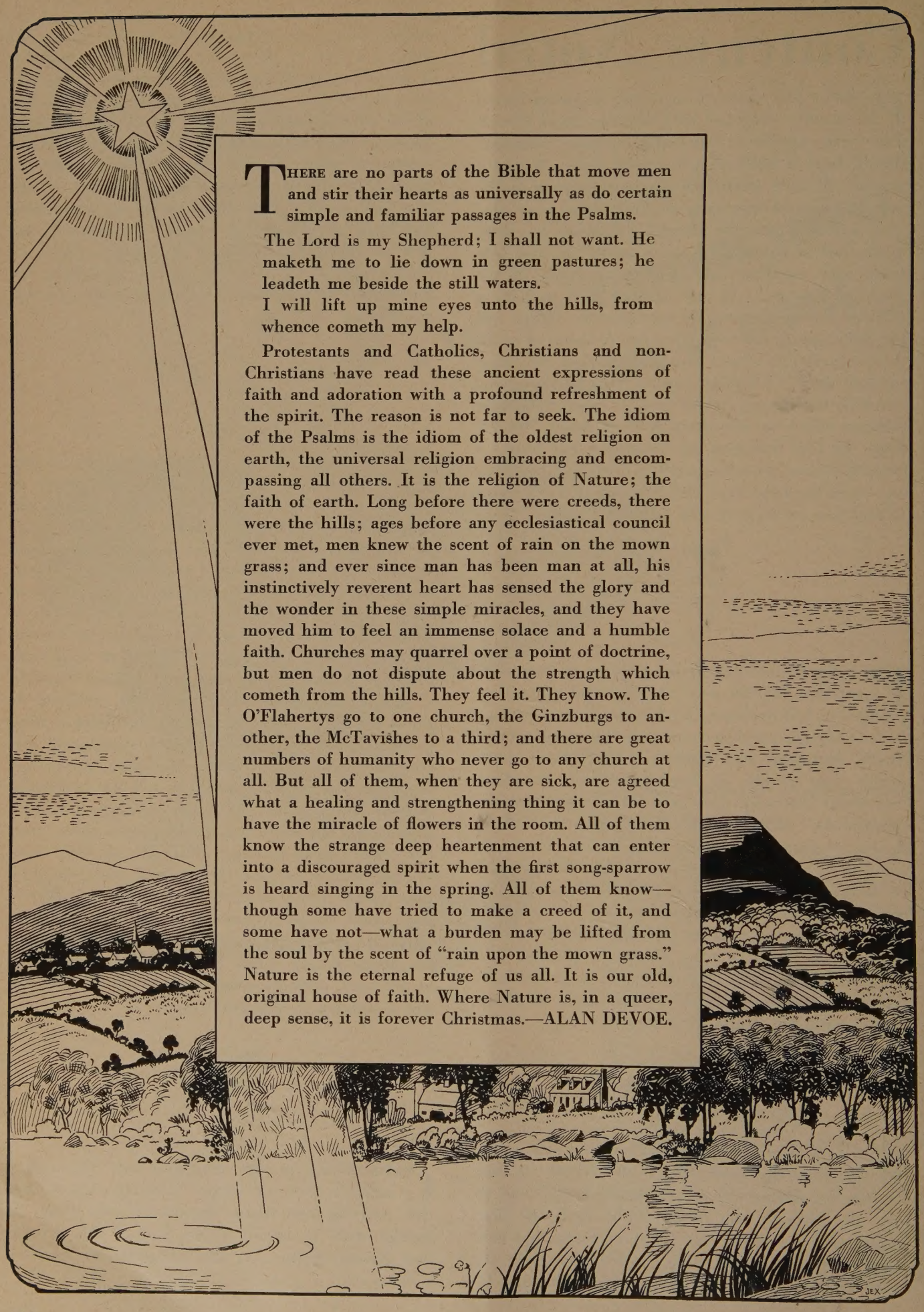
WE HAVE been meaning to say a word about a new "comic strip" that turned up recently in the *Washington Post*. It is called "Mark Trail," and is from the drawing pen of Ed Dodd. It is the first feature of this sort that, so far as we know, has had conservation of wildlife as its basic theme. Love interest and the menace of villains play their part, of course, since these seem essential to such strips, but Mark is a lover of the wild, a wildlife photographer. A notable bear picture wins a magazine prize and saves the wildlife sanctuary maintained by the father of the girl in the strip. Enemies start a fire, with dire effects on the wild animals. As we write this, episodes connected wth a beaver transplanting project are being presented. If your local paper does not yet run this strip, a word to the editor might jog his interest and bring to the paper a "comic" of real worth, not that we look down our nose at "comic" strips—we read every one in the *Post* except Superman, the reason for the existence of which we will never discover.



USUALLY, one way or another, we are able to find a satisfactory answer to the many letters of inquiry we receive. We failed the other day, but only because, we believe, the letter was unanswerable. It came from a lone lady, past the three-score mark, we gathered, and possessed of a small income. Where, she asked, could she go—South in the winter, North in the summer—and associate herself with people in similar circumstances and also interested in Nature. French by birth, this lady said that there were such places in France, Switzerland and Germany. Possibly it is true that *pensions* are variously scattered in those countries to which like-minded people have gravitated, with or without plan. If comparable havens exist in the United States they have escaped our attention, and we were forced to tell our correspondent so. But she does raise a question that should be answerable. She avers that, as she puts it, those "who have been slaves to responsibilities" all their lives should be able to pass their sunset years enjoying those things they love most—in her case the outdoors with other Nature enthusiasts. Perhaps we need an Old Folks Hostel movement, or some Audubon homes for elderly people. Until, however, someone awakens to the need, perhaps some of our readers could suggest a solution to this problem.

COMMENTING on our article about "squeaking" animals to attract them, Chapman Grant says that a flying bat, when "squeaked," will drop, as though shot, to within a few feet of the ground, then resume flight. Try this the next time you see a flying bat.

R. W. W.



THERE are no parts of the Bible that move men and stir their hearts as universally as do certain simple and familiar passages in the Psalms.

The Lord is my Shepherd; I shall not want. He maketh me to lie down in green pastures; he leadeth me beside the still waters.

I will lift up mine eyes unto the hills, from whence cometh my help.

Protestants and Catholics, Christians and non-Christians have read these ancient expressions of faith and adoration with a profound refreshment of the spirit. The reason is not far to seek. The idiom of the Psalms is the idiom of the oldest religion on earth, the universal religion embracing and encompassing all others. It is the religion of Nature; the faith of earth. Long before there were creeds, there were the hills; ages before any ecclesiastical council ever met, men knew the scent of rain on the mown grass; and ever since man has been man at all, his instinctively reverent heart has sensed the glory and the wonder in these simple miracles, and they have moved him to feel an immense solace and a humble faith. Churches may quarrel over a point of doctrine, but men do not dispute about the strength which cometh from the hills. They feel it. They know. The O'Flahertys go to one church, the Ginzburgs to another, the McTavishes to a third; and there are great numbers of humanity who never go to any church at all. But all of them, when they are sick, are agreed what a healing and strengthening thing it can be to have the miracle of flowers in the room. All of them know the strange deep heartenment that can enter into a discouraged spirit when the first song-sparrow is heard singing in the spring. All of them know—though some have tried to make a creed of it, and some have not—what a burden may be lifted from the soul by the scent of "rain upon the mown grass." Nature is the eternal refuge of us all. It is our old, original house of faith. Where Nature is, in a queer, deep sense, it is forever Christmas.—ALAN DEVOE.

# The Coming Era of Sun-Power

*By* LOUIS N. SARBACH

If we are to perish eventually by atom blast, we should realize that we also live by it. Nothing in our ordinary lives is commoner than atomic fission. Only a person congenitally and totally blind can honestly say that he has never seen an atomic explosion.

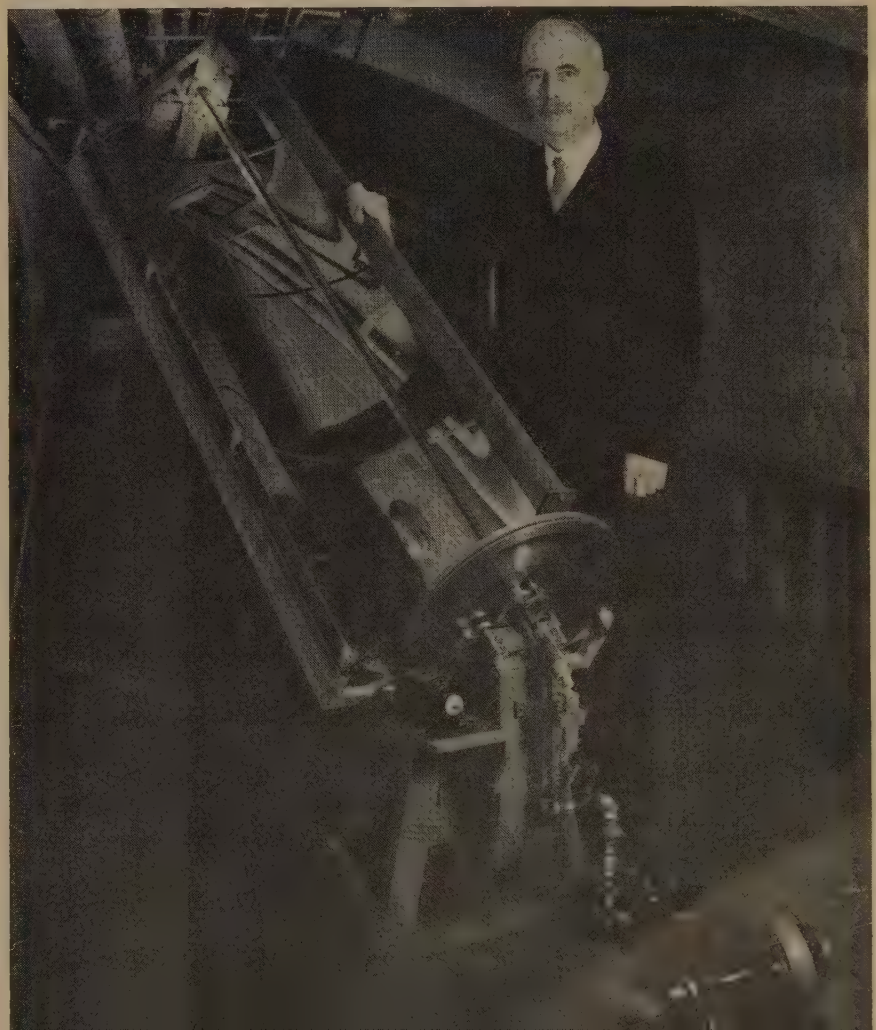
For this is what happens on the sun, on a scale so vast that it eludes our ability to visualize, much less comprehend. Were you impressed by the world-shaking column of heat and light that reared itself forty-thousand feet skyward over Hiroshima and Bikini? Consider, then, that solar "prominences," flaring half a million miles into space, are commonplace on the mother-star. The calculable—if unimaginable—volume of radiant energy billowing outward into our universe is source and support alike of our planetary existence.

Can we capture this power and put it to work? We can and we do. It has been stored in coal, oil and waterpower. We release it rapidly or slowly, in large or small quantities. We carry it anywhere and everywhere, for any or all of thousands of purposes.

Can we capture it *directly?* Yes!

Man, who has tried to harness sun-power since the days of Phaëthon, is now on the verge of seeing one of his most cherished dreams fulfilled. Helio-science has become as new as tomorrow, with seven-league strides in several important directions. On the common level are new solar houses and practical "sunshine traps" for domestic use. Corresponding industrial applications are beginning to appear, particularly in the Soviet Union, where a new approach to sun-mirrors has yielded revolutionary results. On the scientific level, projects have been initiated that, on completion, are going to change human life and living in many ways, and the potentialities of all these studies and developments are measurable only in terms of the sun's importance in our scheme of things.

There was wholesome respect for the sun from the very beginning. Ra in Egypt and Phoebus Apollo in Greece are only two of a hierarchy of sun-gods as numerous as the tribes of humanity. Physically, the sun appeared to the ancients as a brilliant disk about the size of the moon. Galileo's telescope, and Newton's pioneering spectroanalysis of sunlight, set helio-science on the broad highroad to modern times, along which it has been enlarged and illumined by the work of scientists like Fraunhofer, Einstein and Bethe. Today's sun is neither god nor moon-sized disk, but a typical star of moderate proportions (as such things go), weighing in the region of 2,000,000,000,000,000,000,000,000,000 metric tons—two octillion.



**Dr. Charles G. Abbot, America's leading helio-scientist and retired Secretary of the Smithsonian Intitution, stands beside a sun-power machine of his own invention.**

The sun's brightness is the brightness of atomic transmutation. According to H. A. Bethe's widely accepted "carbon cycle" theory, hydrogen atoms are being turned into atoms of helium, in the course of which a part of the sun's mass is "destroyed." The rate of destruction—4,200,000 metric tons per second—seems staggering to us, but the sun can lose weight at that rate and still last five and a quarter trillion years!

These lost tonnages plunge from the sun in every direction as radiant energy. Our earth, a kind of pinhead in space, intercepts only one two-billionths of the total solar output. This nevertheless equals, in three minutes' time, the United States' annual consumption of power from all sources. In other words, in a single hour the earth receives solar power equivalent to that produced by the burning of twenty-one billion tons of bituminous coal. Is it surprising that inventors have dreamed of ensnaring the sun's rays? Few projects have seemed so enticing . . . or have proved so disappointing.

The key to most failures to harness solar power lies mainly in the inefficiency of the devices. Energy rated at 1.5 horsepower per square yard arrives from the sun, but by the time it has passed to utilization its strength has dropped to 0.1 horsepower per square yard, or less. To utilize sun-power thus becomes a real problem. It must be focused, collected and stored, and all of these requirements have given trouble. For centuries men have experimented with the mirror to devise one whose magical curvature can trap enough of the fugitive beams to ensure an efficient concentration of solar heat.

An early tradition, nearly as hoary as that of Apollo himself, tells of huge mirrors erected by the mathematician Archimedes to set the besieging Roman navy aflame at Syracuse in 212 B. C. Like most of its successors, this legendary sun-machine was a failure; Syracuse fell to Rome, and the distinguished inventor was slain.

Modern devices date from 1901, when the complicated Eneas "solar generator" was patented. Eight years later, Boyle and Willsie reported a sun-machine with a stationary mirror, a feature that practically guaranteed low heat of operation because of the oblique approach of the solar rays most of the time, and the low temperatures reached. Shortly before World War I, a group of enthusiasts organized Eastern Sun Power, Limited, and erected a plant on the banks of the Nile. Their idea was to capture sun-power for irrigation. The war interrupted this activity, and operations were never resumed.

America's best-known helio-scientist is Dr. Charles G. Abbot, retired secretary of the Smithsonian Institution. Analyzing his predecessors' failures, he spent a lifetime producing sun-mirrors of improved potential. By 1941, Dr. Abbot had raised the efficiency of solar devices to 15 per cent. With his solar oven, patented that year, one can bake bread or cook a dinner. Two years later, he announced that any western state—such as New Mexico—using machines of the "type now in existence," could furnish from solar radiation "more power than is now used for heat, light, transportation and manufacturing in the United States, and at a cost not perhaps exceeding the present cost of power from coal."

This statement was widely quoted, and Dr. Abbot's work received far-flung recognition and publicity. Despite his optimism, however, the power experts shook their heads. It was not enough merely to equal the effectiveness of standard sources of power. "He'll have to do better than that" was the dictum of Professor C. C. Furnas of Yale University.

Meanwhile, in Russia, they were experimenting at

**Sun laboratory at the Massachusetts Institute of Technology, where research on the utilization of solar radiation for house heating is being carried on. "Heat traps" or energy collectors through which water circulates are being inspected. In the upper, left-hand corner of the roof is a pyrheliometer for recording the intensity of sunlight throughout the day.**

the Power Institute of the U.S.S.R. Academy of Sciences. There Dr. F. Molero and his associates are reported to have produced successfully large solar power machines. It is difficult, however, to get detailed information of Soviet advances, so that an exact evaluation of their success is not yet possible here.

For years it has been known that the best mirror for focusing solar rays was one of a highly complex curvature known as the "paraboloid of revolution." Both the Soviet investigators and Dr. Abbot use parabolic reflectors, constantly refining their designs.

Men at last have conquered the problem of capturing solar energy directly, making overwhelmingly available the only unlimited supply of energy known to exist in our universe. For cheap as coal, oil and waterpower undoubtedly are, the first two are limited in amount, a fact that necessarily predicates an inevitable although gradual rise in extraction costs as the years go by. And waterpower, also limited in amount, involves the initial cost of dams, not to mention high maintenance charges afterwards.

Construction, installation and maintenance costs of solar power arrangements will be relatively low. The solar energy captured by a paraboloidal mirror is proportional to the mirror's diameter, squared. It will be best to establish solar power plants in the world's more sunny areas, such as the southwestern United States. Power gathered in vast quantities on bright days can be stored as super-heated water for use at night or during cloudy periods. Seasons of the year have little effect upon the operation of these devices, except insofar as there is more or less cloudiness. This development holds especially bright promise for the arid or semi-arid regions of our western states, for some day they may become the nation's dominant manufacturing centers, thanks to the sun.

The first industrial solar plants are already in operation. Last January the trade magazine *Power* announced the installation of two Molero solar converters at the great government cannery at Tashkent, Uzbek, U.S.S.R. This is an agricultural region of central Asia, remote from sources of ordinary fuel. The solar converters have made long-distance shipments of fuel to Tashkent unnecessary. Another important feature is that Tashkent's largest power requirement happens to coincide with those months of the year when sunlight is most plentiful.

Results at Tashkent have not yet been reported. However, Dr. Molero is emphatic on the point that solar converters have ceased to be novelties, or merely curious contraptions of dream-eyed inventors. "All fundamental questions pertaining to the manufacture of solar energy converters have already been settled," he says. "We are able to produce sub-assemblies serially for subsequent assembly on the spot. Everything now hinges on their further simplification and reduction of production costs." Maintenance costs, of course, are negligible.

But sun-power can be put to work at lower potential without complicated mirrors or elaborate boiler-tank arrangements. A closed-cycle system, in which sun-heated water circulates from a "solar absorber" on the roof of a building to a storage tank, is a simple yet effective way of cutting down your gas bills. If you live in the South or Southwest, you may have seen such a water heater in action. Already, by 1941, more than ten thousand Florida homes had been equipped with them. Sun-heated water often attains a temperature of 206°F., which is only six degrees under boiling. If the system is properly insulated, heat-loss is less than one degree per hour. Installation costs are considerable although not unreasonable, but operation is as free as is the sunlight.

**Dramatic fusing of the indoors and the outdoors in a solar-type dwelling in Old Westbury, Long Island, designed by Edward D. Stone, architect. Homes utilizing the radiation of the sun in this way require far less artificial heat than the ordinary type of home. Glass areas are fixed, except for ventilating louvres at the left. Photograph courtesy of Libbey-Owens-Ford Glass Company.**

By extending this kind of system, entire buildings can be heated by sun-power. General Edmond Pasteur of the French Army Medical Corps claims to have developed solar radiators to the point where he is able to furnish all the heat necessary for the hospitals in Algeria. But an even more significant method of using solar energy abandons the idea of pipe systems and storage tanks altogether. Let the rays stream right into your living room, say the designers of "solar houses," who have made millions of Americans aware of sunshine in the last few years as never before. They will intrigue the architects of tomorrow.

It all started, according to Ralph Wallace, writing, appropriately enough, in the Baltimore *Sun*, when George Fred Keck, young Chicago architect, visited his "House of Tomorrow," which was being built for the Century of Progress Exposition in 1933. It was a bitter cold January day, but inside the building, 90 per cent of whose wall areas were clear glass, the workmen had shed their coats and were perspiring. Sunlight pouring in through the glass walls was the only source of warmth. The idea of heating a house with sunlight was here being demonstrated—by accident!

A decade later, Keck and other experts eliminated the last "bugs." A solar house, as now perfected, uses only two-thirds as much fuel as a conventional house of comparable dimensions. Through its all-glass, south-facing front, it admits a wealth of natural light, which saves its fortunate inhabitants from much of the eyestrain that seems to be one of the penalties of western civilization. Occupants of a solar house save on their electric bills. They do not have to turn on lights in the evening until fully two hours after neighbors, dwelling in ordinary houses, have turned theirs on.

No recent development in housing has so taken the American domestic imagination. Thousands of solar houses have already been built—a whole real estate development in Chicago is called Solar Park—and tens of thousands are being planned, complete with triple-glazed walls and sun-fast carpets, drapes and upholstery.

The foregoing is a record of achievements that reflect human determination to gain ascendency over the basic power-source in our part of the universe. Reliance on power from coal, oil, and other sources of previously-stored energy, is reliance on power at second-hand. True enough, there remains in the earth fifty times as much coal as has been extracted to date; on the other hand, human demands for power have grown until now, in our complicated way of life, we are using more than one hundred times the energy actually required by our bodies. And the rate is steadily increasing. Furthermore, with the spread of western-type civilization to other continents and to the so-called backward peoples, demands for cheap power can only be expected to multiply. Meanwhile, discoveries of new deposits of coal and petroleum lag far behind the potential demand.

These facts have spurred interest in the direct utilization of solar energy. Grants made in 1940 to Harvard and the Massachusetts Institute of Technology by Dr. Godfrey Cabot set up research programs in these schools—the first formal academic investigations of solar energy. To M.I.T. was assigned the physical aspect of power collection and application — sun-machines. At Harvard the approach is from an entirely different angle. There, solar energy is being studied as part of a photo-chemical reaction, as in photosynthesis.

Our principal power sources today, coal and oil, are of vegetable origin. One scientist has allowed himself the luxury of oversimplification in order to emphasize the role of sunlight in the manufacture of these natural vegetable fuels. Water, he says, plus carbon dioxide, plus sunlight, plus the presence of a catalytic agent, give the basic materials of all complex plant substances. Then we come along, take the finished plant substance, mix it with oxygen (burn it, that is), and thus release the stored-up solar energy.

The purpose of the Harvard studies is to try to develop, synthetically, a catalytic agent similar to Nature's mysterious green chlorophyll, without which plants cannot perform the above chemical reaction. With such a catalyst, we shall be able to use carbon dioxide and water to imprison sunlight for subsequent storage and eventual release at our pleasure. We shall, in brief, be able to manufacture our own coal and oil!

If either approach to the problem of capturing solar power is crowned (Continued on page 550)

# Garden

*By* C. E. GAPEN

Mellow ground that smells so old,
Grist of complex parts untold,
Alive and dead, sweet and sour,
Some from the ages, some the hour,
Crumbled with a frosty lace,
Lying waiting, full of grace.

Underneath it, fold on fold,
Light as lithium, heavy's gold,
Down through coal that came from peat,
On through water, stone and heat,
Down into a seething center
Dreadful for a mind to enter.

Up above, the heav'nly hold—
Flights are endless, distance bold;
Nothing stops huge astral things
Brushing earth on noiseless wings.
Wonder beats at frost-filled blue,
Lonely lanes with little clue.

In between the heat and cold,
A film of soil, the happy mold.
Hands grope for loam and press it down
About the roots, above their crown.

This comfort zone, confined as I,
Links us to the rock and sky.

**Montana and Cherree and their nestling, with Cherree apparently very proud of it.**

# Days with Evening Grosbeaks

*By* H. ROY IVOR

*Photographs by Hugh M. Halliday*

MONTANA and Cherree had completed their nest. Three eggs had been laid and one nestling hatched. It was almost time for the youngster to leave the nest, when the urge came to Cherree to rear another brood. She examined the old nest; decided, apparently, that a little building up of the edge would make it as good as new.

That the baby was not quite ready to leave did not seem to bother the mother bird. 'Tana was doing most of the feeding, anyway, so Cherree had time on her hands—or should we say on her wings?—and seemed to possess an overpowering urge to hurry before it was too late for a second brood. She began collecting rootlets, which she carefully placed on the inner edge of the nest, then moulded them with her breast. With the growing youngster in the way, this was a difficult feat. Progress was slow and much of the material fell to the ground.

As it has not been known hitherto that evening grosbeaks had two broods in a season, I was anxious that nothing should interfere with what might be an important discovery. So an abandoned robin's nest was fastened close to the grosbeak's nest, relined with grass and the youngster placed in it. There was no objection from either parent, and refinishing the old nest went on with more speed.

Cherree, however, did not neglect her baby. To feed it and to build had an equal appeal, leading to conflict between two desires. Once, as she flew to the nest with a pliable twig, the nestling called loudly for food. Cherree hopped to its side and it gaped, ready for food. The mother wanted to feed her offspring, yet wanted to use that twig in her nest. Finally, as the nestling continued to gape, she placed the twig crosswise in the wide-open mouth, which was no solution at all.

Comparatively little is known of the nesting habits and behavior of evening grosbeaks in the wild. Probably not more than fifty or so nests have been found. Breeding in captivity has been attempted for many years in various countries, without success until 1938, when a Winnipeg naturalist succeeded in rearing part of a brood.

To gain knowledge of how evening grosbeaks con-

struct their nests; what material they prefer; the incubation period, of which practically nothing is known; and other facts, I tried for several years to induce these birds to breed. In 1936 I succeeded in having them build, lay eggs, and hatch young, but the nestlings lived only a few days. Failures followed during subsequent seasons, until 1942.

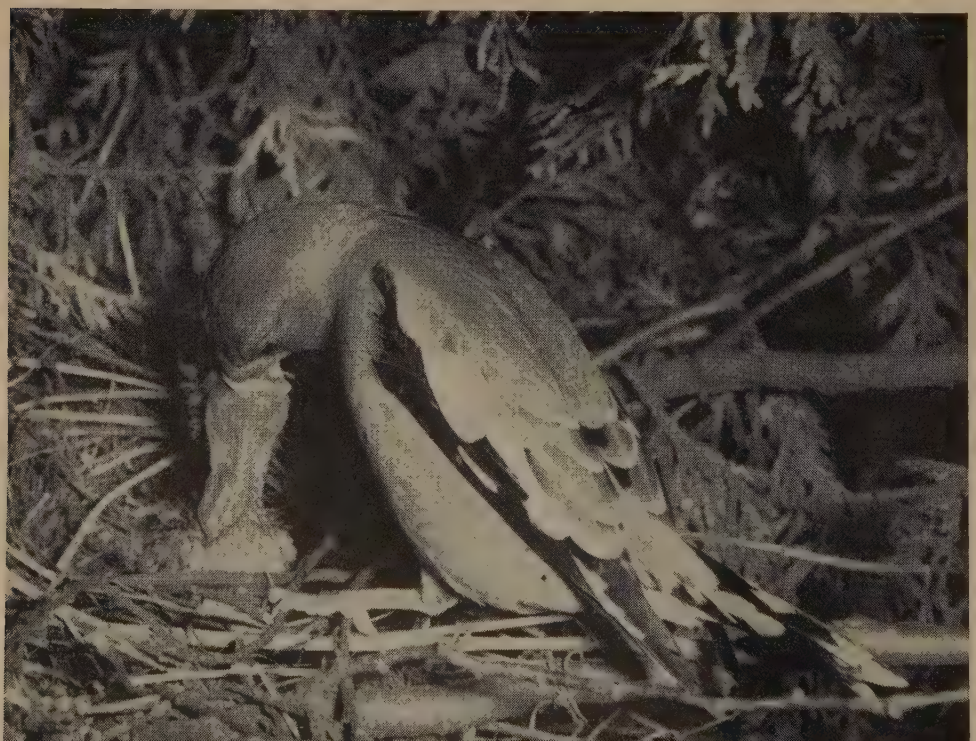
For a number of years Doris Huestis Speirs had carried on intensive studies of these birds in their natural habitat, from New Hampshire to California, and in captivity at the Vivarium of the University of Illinois. Wishing to make an intimate study of their nesting behavior, a study that seemed almost impossible in the wild state, Mrs. Speirs brought to me, late in May, 1942, two male evening grosbeaks, in the hope that we might mate them with the females already in the summer aviary. If this could be done successfully, facts might be gleaned to add to the present rather scant knowledge we have of these birds.

My summer aviary is an octagon with large nesting compartments surrounding the main flight. Two compartments, Nos. I and VIII were reserved for our grosbeaks. When they mated they would have many neighbors. In II were the wood thrushes, Vee and his mate with their three feathered young; in III, Robbie, the male robin; in IV, Whitering and his mate, the rose-breasted grosbeaks with one nestling out of the nest; in V, Little Blue and Josie, the bluebirds with five newly hatched babies; in VI, the catbirds, Fuss and his mate, with four youngsters almost ready to fly; in VII, Cher, the eight-year-old rose-breasted grosbeak, whose mate was incubating their eggs.

We had decided that as soon as the pairs were formed, nests built, and the first egg laid, the evening grosbeaks would be given the same liberty as was given to all the other nesting birds. The egress and ingress to the compartments would be by a small gate in the outer mesh wire, similar to that used by other species during the nesting season. Early in June 'Tana mated with Cherree, an old female, and they were placed in compartment I. Then Vesper mated with Tina, a female belonging to Mrs. Speirs, and they were put in VIII. Arbor vitas, growing in these compartments, made ideal nesting sites.

Thus began a delightful experience; a prelude to the beauty to be seen often during the following days. The male evening grosbeak is an exceedingly handsome bird. The large areas of golden yellow, shading to umbery-bronze, stand out in striking contrast to the black and white of his wings. But to see him in all his beauty he must be seen as he courts his mate a few feet away. The male's wings are spread wide, rapidly vibrating, drooped so low that they almost scrape the ground; the tail is partly spread and slightly elevated; the head is retracted so that the beak is pointing straight at the sky. Gradually the male approaches the female, his head and body weaving in an erratic dance. Then, he looks like some gorgeous tropical butterfly rather than a bird. Yet his mate does not seem to be nearly so much impressed as we, or, if she is, she does not show it, for she goes quietly about the business of building as though he were not there.

Neither Tina nor Cherree was at all satisfied with the nesting material first given them. Twigs of various kinds were picked up and discarded; none seemed to suit. It was then suggested by Mrs. Speirs that I try supplying them with the same kinds of material they use in their far northern home. I collected brittle pine twigs, and ripening shepherd's purse, from which I stripped the seed heads. These, cut into six-inch lengths, were scattered on the ground with the pine twigs. Then building really began. Cherree had been with me many years, yet she had not forgotten the essentials of nest building. Later I supplied the pair with many fine, thread-like rootlets of shrubs, and these they used for lining.



The nests of both pairs were finished. In each the first egg was laid. The small gates were opened, and soon all four birds found their way out. Excitement was rife; incessant calls to one another were heard as they explored many trees and the wooded ravine. For an hour or so the new freedom was enjoyed, then Tina returned to her nest, while her mate, Vesper,

**Although torn between the urge to build and to feed the nestling, Cherree did not neglect the young one, although she did confuse the two instincts.**

**"Oro," which was the name given to Montana's and Cherree's nestling. Here the youngster is shown at the relatively tender age of fourteen days.**

and 'Tana with Cherree explored farther afield. Then disaster! Vesper failed to return. Did a sharp-shinned hawk, suddenly, like a bolt from the blue, streak with terrific speed from the woods? We do not know; but Tina had a mate no more.

Rarely do these hawks nest in the vicinity of the aviary, but it was now evident that a pair had located within hunting distance, as Josie the mother bluebird, and Cher, the old rose-breasted grosbeak, were taken. Continued liberty for the grosbeaks was now out of the question, at least for the season. Tina's gate was closed. A little later 'Tana and Cherree returned to their nest, and their gate, too, was closed. Our experiments would, for this year, have to be carried on under the old and hitherto unsuccessful conditions.

Three more eggs were laid in each nest. Of course we hoped that Tina's would hatch even though the last three were laid after Vesper had disappeared. But Patsy, the female cowbird, was determined to give Tina another egg to take care of. All the cowbird's spare time—she had plenty—was spent trying to find an opening in the mesh large enough to squeeze through. Her persistence was rewarded, for at last she found a broken wire—it took us hours to find it, later. We found one of Tina's broken eggs on the ground, and Patsy inside, no, not the egg—the compartment!

Anxious days followed on account of the sharp-shinned hawks; the fear of prowling cats. Yet, with all the anxiety and the seemingly never-ending care of this busiest season of the year, we had beauty at its best; beauty of both sight and sound.

In due time two of Cherree's eggs hatched. A continual hunt for insects and ant larvae was now in order. Fortunately these grosbeaks enjoyed earthworms, although they were almost as difficult to find as insects, on account of the drying earth. None of the favorite grosbeak seeds were given, as it had been found in a former year that these would be fed to the newly hatched youngsters with disastrous results. However, various nestling foods were supplied, and these were relished by the parents. But, with all our care, 'Tana and Cherree were able to rear only one of the little ones. This was the one into whose mouth Cherree had placed the twig crosswise.

Cherree finished her second nest and laid three more eggs. None was fertile. After all, Cherree is old; too old to be a successful mother twice in one season. But we had learned, for the first time, that these birds sometimes nest twice a year. Too, we were successful in rearing at least one nestling to maturity—this for the second time in these birds' captivity.

Tina continued to incubate her remaining eggs, but when none had hatched in fifteen days, we took them from her. As she did not want to leave her nest we gave her, in their place, the only newly hatched infant that could be found—a tiny indigo bunting. Even the adult bunting is such a little bird that we had grave doubts that Tina could feed and rear the tiny one, for her great bill is larger and heavier than that of any of our smaller song-birds. However, she was as gentle and careful as though it were one of her own. In time the youngster acquired its coat of darkest blue and grew to its full beauty.

# Whistling Ghosts

*By* CHARLES P. MOUNTFORD

AUSTRALIA is yet too young a country to have many historical ghosts, except maybe those of bush-rangers. She has had no Loch Ness monster, the nearest being a mythical animal called the "bunyip," created to solve the mystery of an unusual track found in an area of country shunned by domestic animals.

Nevertheless Australia has her own "haunted woodlands," where thousands of tiny voices whistle, whine and whisper, although there may not be a human being within miles. They are the voices of Australia's forest-ghosts. The "ghost" has proved to be a botanists' delight, *Eucalyptus perriniana*, a tree better known as the "Spinning-top" or "Round-leaf Snow Gum."

This dwarf gum-tree with its strange leaves, some discs, some linear, and its smooth, blotched, white bark, is something of a freak even among Australia's 365 varieties of strange eucalypts. It is not widely known, even among Australians, because it grows only in certain mountainous areas of southern Australia, and is really quite insignificant among some of its big brothers of the mountains.

A large *Eucalyptus perriniana* would be only fifteen to twenty feet in height compared with the 300-odd feet of some of its neighbors. Its trunk, of course, is too small and pale to attract commercial attention.

Bushland ghost-voices are caused by the wind blowing on the unique, juvenile leaves. These leaves, circular in shape, grow opposite each other in pairs, but fuse to form a complete disc. They are a plant curiosity because, instead of growing out of the stem, they grow around it. A stem may have an indefinite number of paired leaves, and looks for all the world like a skewer run through a handful of uncooked potato chips.

When the juvenile leaves die and dry, they become loose and develop a curl, which catches the wind. In the lightest breeze they spin around the stem, making an eerie whine not unlike an aboriginal "bullroarer," or, when they rub against leaves still firmly attached, they create a modulated whistling noise.

The mature leaves, a secondary and more permament leaf-growth, are, like those of any other eucalypt, long, thin and tapering, and this botanical peculiarity has given rise to other tales. The most popular is that the spinning-gum quickly turns to an ordinary blue gum if taken away from its natural "haunted" habitat. Many, however, have been transplanted to Hobart, Australia's southernmost capital, and this story has been shown to be false under observation.

PHOTOGRAPHS COURTESY OF AUSTRALIAN NEWS AND INFORMATION BUREAU

**An oddity among Australia's 365 varieties of eucalypts is the "spinning top" or "round-leaved snow gum." The juvenile leaves are orbicular, as seen above, and supply thousands of tiny voices in the woodlands as the winds whistle, whine and whisper through them. The mature leaves, shown at the left, are linear lanceolate like any well-behaved and orthodox gum-tree.**

# Deer Rendezvous

*By* JANET MOORE

*Illustrated by Clarence Tillenius*

LAST summer four of us vacationed in a little valley high in the snow-crowned Cascades of Oregon. The nights held a nip of frost, but the days were long golden dreams under the bluest bowl the sky-potter ever fashioned. Our cabin grounds were glorified by flocks of cedar waxwings, arpeggios of the purple finch, flashes of the orange coat and crimson head of the western tanager, all capped by the lordly presence of the great blue heron. We came to recognize the track of bear and porcupine, and witnessed on every hand the ingenious craftsmanship of the beaver. Although not particularly interested in meeting these animals, we felt that our vacation would be woefully incomplete unless we encountered at least one Bambi.

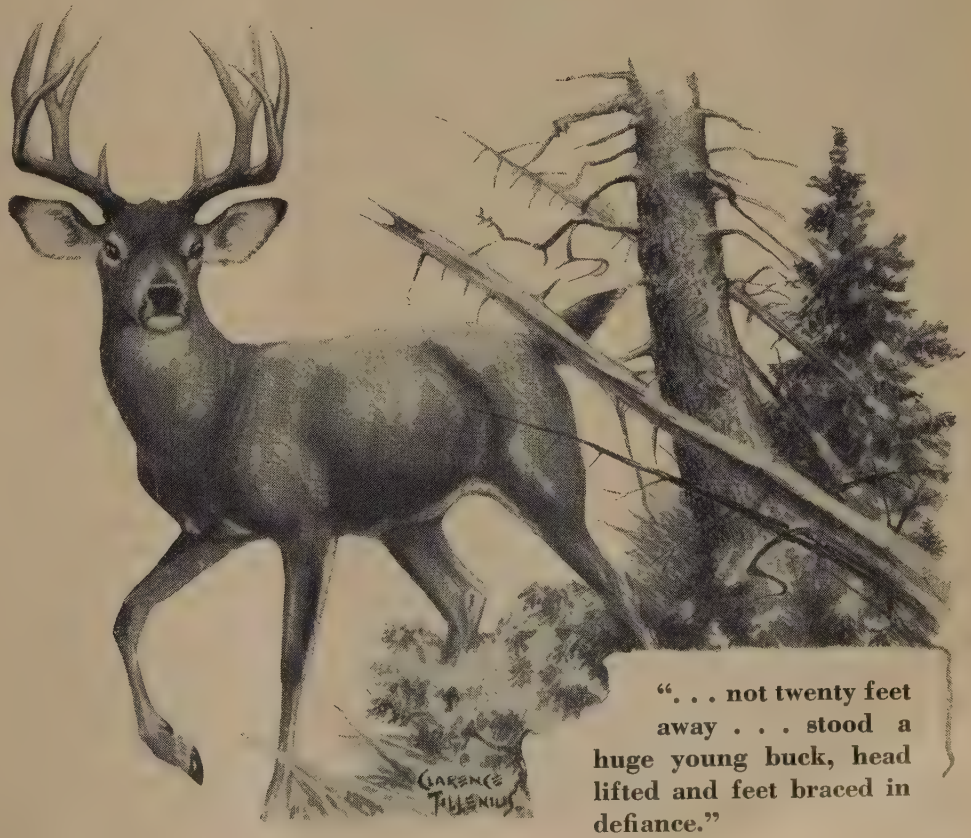
Dainty two-toed tracks, leading to the river and vegetable gardens, were proof of nightly deer visits to the settlement, probably in the wee small hours. And the owners of the devastated gardens claimed they never caught sight of the shy, fleet-footed marauders. Neither did we, although we watched each evening until well after dark. That is, we had not until that last memorable evening. Then, at the suggestion of an old-time inhabitant, we visited at dusk a certain clearing farther removed from the summer cottages, and completely surrounded by tall pines. Here a field of alfalfa in its lush second growth supplied the browse exactly suited to a deer's taste.

We women went, none too hopefully, a half hour early so that we might be located before any of the sensitive creatures should appear, the men promising to come later. A good-sized log part way up the slope bordering the meadow afforded us a ringside seat behind a curtain of pine boughs. A wide-antlered old mule deer was already cropping the succulent plants. He lifted his head once or twice while we were getting settled, but our cautious movements and soft-soled shoes prevented alarm. Field glasses brought him close, so close that we knew his keen eyes would have detected us except for our pine screen. At last we had seen our deer and could go home satisfied, even if this proved to be the only one.

Presently by twos and threes from the farther side of the clearing, others began to slip soundlessly into the meadow. To our city eyes it was like a glimpse into fairyland. We scarcely breathed, and spoke only in pantomime, so fearful were we of betraying our presence. When a doe and two stilt-legged fawns trotted noiselessly down the hill a few yards to our right, we knew we were indeed admitted to the holy of holies.

There were now eight animals scattered about the field, their warm fawn coloring splotched in bold relief upon the cool jade background. From time to time a head, lifted in our direction, gave momentary concern that hearing or scent had found us out. Each time, however, feeding was resumed as though vigilance were only a routine precaution. As the shadows deepened, the deer became mere yellowish blurs against the green. Binoculars, however, still brought them close and eliminated the purple twilight haze, seeming to restore the fast fading daylight. Then, as if to give us our money's worth, two bucks staged a short silent combat with lowered heads and locked horns.

The evening's climax came suddenly. Close behind us sounded a sharp "Psst." (Continued on page 550)




". . . not twenty feet away . . . stood a huge young buck, head lifted and feet braced in defiance."

# A Guy Named Bill

*By* ANDREW THOMSON

Bill and the Author

BILL was a bluejay. We first met some years ago on the grounds of the Apawamis Club at Rye, New York. He was just a nestling that had fallen from the nest, but hundreds of people were to know and love him.

Carried to a grass-lined box in the golf shop, Bill set up a fearful row, subsiding only after he had been left alone for a couple of hours and became used to the idea. Then came the problem of feeding. After much trial and error, I managed to get some milk-softened bread crammed—and I mean crammed—down his throat with the handle of a spoon. That was the first and last day of Bill's bread and milk diet, but it kept him alive, and he was squawking loudly the next morning when I arrived at the Club. He demanded food.

That day Bill really started to live. Worms were dug for him. Caterpillars, all too plentiful that year, were gathered. Fresh fruit and vegetables came from the kitchen. And Bill now knew what a spoon was for—and noisily. It took only two days for fear of human association to leave him. In fact, he was downright fresh, and, even at that tender age, could give you a mean and scornful look.

Within a week Bill was no longer content with his box. He preferred to hop about the work-bench, poking his beak into everything and everybody's business. He had mastered the spoon-feeding technique, and grew lustily on a varied diet. In four weeks he was fully grown, so I felt that he should have his freedom. Taking him to a spot a few hundred yards from the clubhouse, I said goodbye and tossed him into a tree. Arriving back at the golf shop I was greeted by the most indignant jay in the land. Like the cat in the bag, he was home first. And there he stayed, never to leave.

During the weeks and months that followed, Bill developed mentally and physically. He took on his adult plumage and was a magnificent bluejay—a swashbuckling, confident, egotistical, critical blade. He spent most of his time outdoors, acquiring new friends and learning new tricks, including a few mischievous pranks. He could catch a nut tossed into the air with ease and graceful timing. He took special delight in untying shoe-laces, or sneaking a nut or bug into the trouser cuffs of any unsuspecting member. In the grill he would take every match out of the boxes in the ash-tray box holders, defying anyone to do anything about it. He would follow a foursome over the course for a few holes, then, spying another on the seventeenth hole, he would fly over there to see if the golf being played was better. Perched on the back of a bench, or on some friendly shoulder, he would watch a tennis match with the air of a seasoned expert.

One day, on the first tee, a guest golfer not acquainted with Bill's ways had put his golf ball on its wooden peg awaiting his turn to drive. Down swept Bill from some hidden perch. He pushed the ball off the tee, grabbed the peg and streaked off with his plunder. Bill was proud of his hunting prowess. One day he flew into the shop with a small garden snake squirming in his bill, depositing it in my lap with a "how's that" flourish. Another time he glided down with a small field mouse. When I had tossed the mouse away I am sure that Bill swore. The cadence of his voluble tirade was scathing and scornful.

Bill loved to bathe in a shallow basin kept for this purpose. The duration of his ablutions depended on the number of spectators. With a good audience he was a showman at work, his vanity overflowing. Bill would demonstrate where not to keep envelopes or rubber bands. With a push of his bill he would prove that ink should never be kept in bottles. Writing with the jay in the vicinity was impossible. He pecked at the moving pen, stamped on the still wet writing, and hid the stamps. A cigaret package left carelessly about never furnished another smoke. If Bill could not get the cigarets out of the pack and tear them to shreds, he made the package look like a colander.

Bill had a few aversions. (Continued on page 550)

# Tuft-eared Squirrels

*By* ROSS AND FLORENCE THORNBURG

*Photographs by the Authors*

ALONG a narrow belt in the Rocky Mountain range from northern Colorado through the Grand Canyon plateau, and on into Mexico, are found the tuft-eared squirrels. This group is unique among North American squirrels because of conspicuous tufts of long hairs on the ears. They easily attract attention because of their large size and showy coloration. There is considerable variation in their coloring, and these forms, resident in definite areas, have been given subspecific names.

Along the South Rim of Grand Canyon, and as far south as the Mogollon Mountains, we find *Sciurus aberti aberti,* upperparts gray with a conspicuous cinnamon or reddish stripe down the back; underparts snowy white, tail dark above, but showing white along the edges and all white on the underside. Just across the Canyon, on the North Rim, *Sciurus kaibabensis,* the Kaibab squirrel, is quite different in appearance, being very dark to black all over with an all-white tail. Far to the north, in a narrow strip in central Colorado, lives *Sciurus aberti ferreus,* which lacks the reddish stripe on its gray back. Its plumy tail is gray edged with white. In this region a melanistic phase sometimes appears, being uniformly dark brown to black all over. In southwestern Colorado and into northern New Mexico is found *Sciurus aberti minus,* a paler form resembling *S. aberti aberti.*

The tuft-eared squirrels live in the Transition and Canadian zones, building nests of twigs, leaves and pine needles. They will line the nest with a piece of your rope clothes-line, or your extra pair of socks, if you leave them out. Nests are usually so high in tall pines or firs as to be inconspicuous, and, sometimes, a hollow tree may be used. *S. aberti* has a habit, as he sits on a branch scolding you, of patting one front

**Those two young Abert squirrels were found, apparently orphaned, by the authors, and were fed until they could take care of themselves. Then they were liberated on the South Rim of the Grand Canyon where there are others of their kind. The picture below shows the plumy tail.**

**An adult Abert squirrel showing the tufts on its ears, from which it gets the name tuft-eared squirrel.**

foot as he talks. Young are born in early spring, but a second or late litter is not uncommon. Three or four in number is the usual litter.

The two little squirrels pictured here were found on August 18 near Flagstaff, Arizona. They had apparently been orphaned, because they were on the ground hunting food. Since bread or nuts did not register as food, we gave them warmed milk administered with a medicine dropper in lieu of a nipple, after one had readily climbed up an extended hand and arm. At first they slept six hours between feedings, and milk was their fare for a week. Then bread and milk in a saucer, and, gradually, bits of melon, or apple and pecans were offered. They loved pecans, but would never touch peanuts, in roasted form at least.

After caring for the two orphans for three weeks we liberated them on the south rim of Grand Canyon, where we knew they would have the protection that all wildlife enjoys in the National Parks. The pinyon pine crop was good, and the squirrels demonstrated that mushrooms and mistletoe berries were suitable food. They romped and played together during the day, and slept the first night or two after leaving their box curled up in the crotch of a tree. Then they moved for a few nights to a small hollow in a pine, and finally found more suitable quarters in an old, abandoned hawk's nest, which a previous tenant had furnished with proper padding. Although they were quite small, instinct seemed sufficient to guide them in the choice of food and to tell them of the need for warm housing for the winter.

# Park Here!

*By* E. E. STANFORD

For the first time in several years, travel is thronging the National Parks, and snow sports will fill some of them during the winter. There are 27 National Parks, so here are 27 questions about the Parks and their marvels. More than 20 answered right gets you the brevet rank of Ranger. Fifteen rates you a Sagebrusher, while less than that rates you a Tenderfoot who should hit the open road and see what you have been missing. See page 552 for the answers.

1. What Government Department administers the National Park Service?

2. Parks are Parks because of the wonders they contain. What are the "Ninety-day wonders" of the National Park Service?

3. In which Parks where bears are found is it against rules for tourists to feed them?

4. What, in Park lingo, is "combination salad?"

5. What Park, in which grizzly bears are now extinct, is known by an Indian name for the grizzly?

6. What Park wonder was discovered because its inhabitants came out for the evening?

7. What Park was discovered by Spanish explorers seeking seven fabulous golden cities?

8. Which Park has a Scriptural name?

9. Which Park is named for a settler who thought "It would be a terrible place to lose a cow?"

10. In which Park did an early explorer report "Petrified birds singing petrified songs in petrified trees?"

11. Which Park is at once farthest South, farthest West, and on the way to the East?

12. Most Parks are 'way out West. Which one is 'way Down East?

13. Which is the smallest Park?

14. Which is the latest to have been added to the Park System?

Now name the National Parks containing the following features. (Each is in a different Park.)

15. A peak the Indians called "The Mountain that was God."

16. Prehistoric dwellings "dated" through annual rings of trees used in their construction.

17. Prehistoric Indian copper mines.

18. Saltpeter deposits used to make gunpowder in the War of 1812.

19. A river that sends part of its flow to the Atlantic; part to the Pacific.

20. The highest mountain in North America.

21. A lake devoid of fish when discovered, and now among the best of our Park fishing waters.

22. The largest tree in the world.

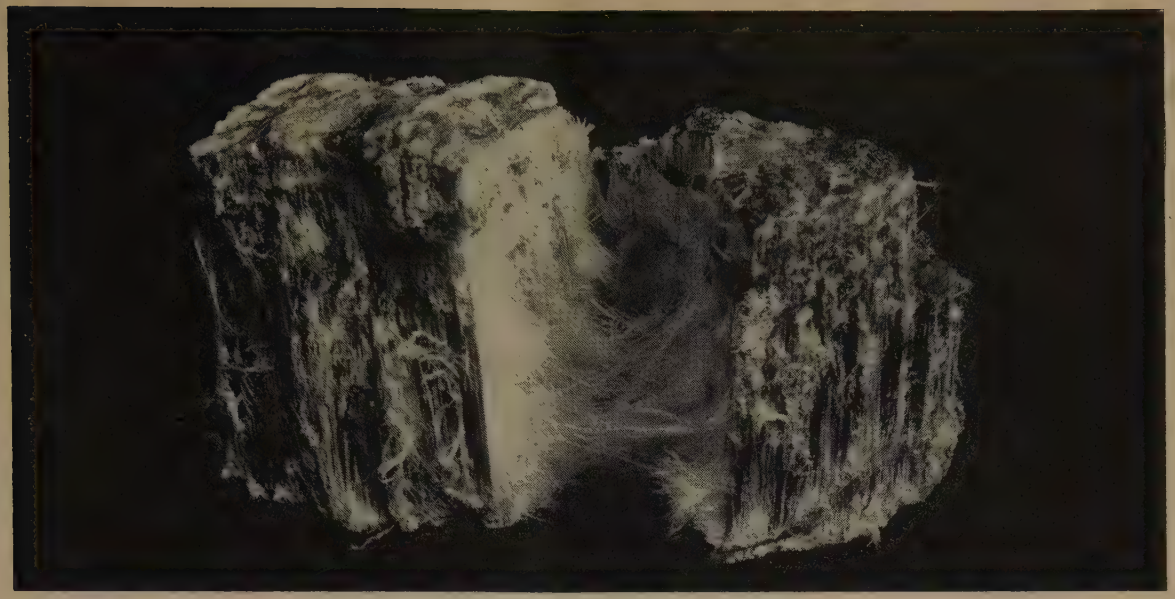
23. Charlie's Bunion.

24. Half Dome.

25. A famous Natural Bridge.

26. The only recently active volcano in the continental United States.

27. Going-to-the-Sun Highway.



PHOTOGRAPH FROM THE U. S. BUREAU OF MINES

**A specimen of crude chrysotile asbestos from an Arizona mine. Note the fine, silky fibers where the lump of the mineral has been broken.**

# Cloth of Stone

*By* EUGENE W. NELSON

IN NORTHERN Quebec the lumberjacks still tell the story of a French-Canadian logger and his "magic socks." One evening in the 1850s the crew of a logging camp in that district came thundering into the bunkhouse after a strenuous day in the melting snows of the spruce forest. Gathering about the red-hot box stove, the noisy woods gang began to undress, wringing the water from their clothing as they did so.

One of the loggers, a newcomer in those parts, hauled off his caulked boots and his saturated socks. When he tossed the latter into the roaring stove his comrades thought he had lost his wits. "*Il est fou, ce type-lá*—burning up a fine pair of socks like that!" When, a few minutes later, the woodsman, calmly ignoring his bunkies, fished his socks from the fire, the loggers gazed in amazement. The footgear was dry, unburned, and *clean*. When he started to put his socks on again, the logger was bowled over in the mad stampede of the rest as they fled from someone surely in league with the Devil. Nor would any member of that tough and lusty crew return to work until "Magic Socks" was paid off and fired.

So far as is known, this was the first—perhaps the only—pair of asbestos socks made. The logger had had his woven from some of the first asbestos mined in Canada, nearly a hundred years ago. The logger could not have known it, of course, but he was repeating a trick that once saved a great emperor from plunging his kingdom into a costly war.

COURTESY ASBESTOS MAGAZINE

**"Gypsy Pot" made of asbestos cloth impregnated with synthetic rubber. Used in emergency by the Army, it will some day be available for campers.**

To the court of Charlemagne, master of Europe, came messengers from Harun-Al-Rashid, Caliph of Bagdad and ruler of the Moslem world. The emperor and the envoys of the Caliph discussed questions of policy, weighing carefully every statement, since a single hasty word might plunge Christians and Moslems into conflict.

Finally, to ease their tired bodies and ragged nerves, Charlemagne ordered a royal banquet. On the table at which king and envoys sat

**Fire-fighters clad in a new type of suit made of asbestos cloth. Such devices are valuable in the task of fighting certain kinds of fires, particularly those breaking out on shipboard, whether in time of war or otherwise.**

PHOTOGRAPH COURTESY
JOHNS-MANVILLE CORPORATION

was a white table-cloth. After the feast, servants took the cloth, by then covered with grease and wine stains, and heaved it into a huge fireplace, where a fire of whole tree trunks roared. The envoys, accustomed as they were to the eccentricities of rulers, showed nothing more than a polite interest.

But when the table-cloth was removed from the heart of the flames, whole and clean, the envoys' knees shook, and they muttered prayers into their beards. In fact, they were so awed by this off-handed display of magical power that they reported to Harun-Al-Rashid that Charlemagne was undoubtedly the top-ranking magician in the world. This report put a sudden damper on the Moslem ruler's ardor for armed conflict, and probably prevented a war with Christian Europe. The table-cloth, of course, was woven from asbestos.

It is altogether possible that such an incident happened. Certainly, asbestos and its peculiar properties were known and used to some extent many centuries before Charlemagne reigned. In fact, the ancients found many uses for cloth woven from this rock fiber.

Among the most curious of old-time uses was the custom of making sacred lamp wicks from asbestos cloth. These wicks were for the lamps that burned "eternally" in temples and on altars. The lamps were fed continually with oil, and the wicks were not consumed with fire, so there was a perpetual flame, much to the mystification of the people who worshipped in those pagan temples. Small wonder, then, that asbestos was considered a magic substance even in early times.

Some twenty-five hundred years ago the Greeks used asbestos cloth as a funeral shroud for their kings. Thus, when a Greek king died, he was wrapped in the cloth of stone and cremated, after which the ashes were carefully removed from the asbestos wrapping. The shroud was then returned to its storage vault until the next king died. Indeed, the name, asbestos, comes from a Greek compound word meaning inextinguishable or incombustible.

The ancient scientists and philosophers, however, never found out just what asbestos really was. In fact, one of the most learned Romans of all time, Pliny the Elder, stated that asbestos cloth was obtained from a flower. This flower, he hastened to explain, grew in the desert, and became so habituated to the desert's fiery temperatures that it could resist heat and flames.

Actually, of course, asbestos is a mineral. It is also one of the most remarkable inorganic products in Nature. It usually occurs in veins, most often in serpentine rock, although in its natural state asbestos is so dense and heavy that it resembles common stone. Mineralogically speaking, most varieties of asbestos are complex compounds made up mainly of the oxides of magnesium and silicon. Its fire-resisting properties come mainly from the silica in its makeup.

Of all the many minerals that Nature has compounded out of similar materials, asbestos is unique in that it is the only one with a fibrous, flax-like structure. This fiber structure, however, is apparent only after the hard, compressed asbestos "rock" has been picked—or "teased"—apart. It then breaks down into a mass of delicate, interlacing, light-colored threads, which closely resemble silk fibers and are somewhat soapy to the touch. When a strand of asbestos fiber is viewed under a microscope of good resolving power, the smallest fiber visible will show a "branching out" at its ends, which is evidence of a still further parting into finer and ever finer fibers.

Geologists are fairly in accord that the characteris-

tic structure of asbestos is due to the fact that, at one time, the original rock (which was not then fibrous) was heated until nearly liquid. Then the rock cooled, shrank, and later was squeezed under heavy pressure. This combination of forces, acting upon the original rock, is believed to have brought about the formation of the silk-like fibers.

Some of the important sources of this mineral are in the Urals of Russia, Africa, and Arizona. Recently, however, most of world's supply has come from mines located in the Province of Quebec. These mines alone have produced as much as 100,000 tons of fibrous rock in a single year, and the supply seems almost inexhaustible.

There is a story told about this particular area of land, where now the rich asbestos deposits are being worked. In the 1870s a Charles Webb tried to sell a piece of his property near Danville in the Province of Quebec. "Nope," James Gifford, the would-be purchaser, decided. "Fifty dollars is too much to pay for a rocky ledge that can't be fenced in for pasture!" Thus he turned down a chance to acquire what was later to become the site of the richest asbestos mine in the world, a mine that was to produce fiber worth many millions of dollars.

Gifford did not know that, even as he spoke, a man whose name was to become as closely linked to asbestos as Rockefeller's was to oil, was carrying on experiments in New York City with the "magic mineral." That man was H. W. Johns, one of the founders of the Johns-Manville asbestos empire.

At that time Johns owned a store where he sold roofing materials. He acquired some asbestos that was imported from newly opened mines in Italy. In fact, Italy is known as the "cradle of the asbestos industry" because asbestos from deposits there was known and commercially worked in England before the Canadian material was discovered for commercial use. Johns had woven this asbestos into a pair of gloves, with which he performed a bit of showmanship that would have won him a nod from P. T. Barnum himself.

Whenever Mr. Johns' shop was well filled with customers, he would signal his assistant. The helper would ostentatiously don the innocent-looking white gloves, open the door of their glowing, pot-bellied stove, and nonchalantly scoop up a double handful of red hot coals. After handling them a bit, he would return them to the stove, then pass the gloves about, showing that they were not even scorched.

These exhibitions were bound to arouse interest in asbestos, and soon there was such a demand for it for various purposes that Johns turned to prospecting for likely deposits of the mineral. Eventually he acquired Webb's ledge, and, in about 1881, blasting began. The first explosions so frightened the horses of Charles Webb's father that the old man was tossed out of his mowing machine.

In those pioneering days, asbestos was mined almost entirely by hand. Now, of course, specially-designed electric hoists, huge power shovels, and other mining equipment are being used to meet the needs of this still-expanding industry. Today, all the asbestos used—more than 300,000 tons every year—is mechanically mined and handled.

Use of asbestos in construction work, the electrical industry, engineering, as a major constituent of brake bands for automobiles, and for other similar purposes is, of course, well known. Progress in the application of this remarkable inorganic product has not stopped, however, and, oddly enough, the latest developments have taken place in asbestos' original province—as a textile.

It may seem strange that such an old and valuable fiber has not been used more freely as a textile material, rather than as a rope, twine, paper, and building board. The extreme shortness of most asbestos

**Chrysotile asbestos from Canada. When taken from the mine, asbestos is seen in many strange formations. Here streaks of asbestos alternate with layers of plain rock. This ore is sent through a series of crushers, where it is broken into smaller and smaller pieces. The asbestos fiber proper is separated from the rock by shaking screens combined with suction.**

PHOTOGRAPH COURTESY OF ASBESTOS MAGAZINE

fibers has been the main cause for this neglect. Long fibers are scarce, although coarse yarns have been woven from them for fifty years. Materials made from such yarns, however, proved too heavy for most consumer goods.

In 1935, B. H. Foster of the U. S. Rubber Company research laboratory in Passaic, New Jersey, started experimenting with a process whereby ordinary, short, asbestos fibers could be spun into yarns fine enough to be woven into lightweight fabrics for clothing and household use. Six years later, his process was far enough advanced so that the commercial production of the new asbestos cloth was begun. This new cloth is quite strong, takes dyes with unusual brilliance, and has excellent wearing properties.

Wartime needs skyrocketed production. By V-J Day the output had reached the fabulous amount of 1,000,000 yards of asbestos cloth a year. Enough of the lightweight fabric was woven to make complete fireproof fire-fighting suits for fully five divisions of men—75,000 G.I's. These suits weigh only thirteen pounds, or half as much as the former outfits weighed. Thousands of yards of asbestos cloth were also used as fittings in war planes, and in the construction of shelters for Air Corps personnel.

Conversion from the production of wartime goods to peace time goods made from strong, light asbestos cloth is already under way. The industry is planning such things as asbestos upholstery that cannot be marred by cigarets, and asbestos awnings for apartment houses, office buildings—awnings that will not be set afire by matches or cigarets tossed carelessly out of windows. Draperies for hotels, night clubs, trains, and buses also will be made from colored asbestos cloth. Thus this new-old cloth of stone will rather soon contribute vastly to our general safety.

★

# The Crested Iris

*By* EDWIN F. STEFFEK

One of our most charming wild flowers is the crested iris, once so comon on hillsides and along streams from Maryland south to Georgia, and west to Mississippi and Missouri. It grows from four to six inches tall and produces its attractive blue and orange or yellow flowers, two to three inches across, in profusion in April or May. It is fragrant at close range, and there is also a white form obtainable for those who wish variety.

This little native does well in the rock garden, but is at its best in large drifts on open or lightly-shaded slopes in thin woodlands. It likes a sandy or gravelly woodland soil, and is not fussy about soil acidity. However, it soon disappears in heavy, wet soils or under heavy competition.

When happy it increases readily by means of its long, thin surface rhizomes, and is best if dug up and divided every three or four years. Late summer, or just after flowering, are the best times to do this. When grown in the backyard or rock garden it is best top-dressed with a thin layer of leafmold and sand every fall.

The crested iris is readily propagated by means of division. However, it may also be grown from seeds planted in a light soil, either in flats or in the open ground, as soon as ripe. They usually germinate the first spring and the plants come into flower the second or third year. When moving them to their permanent location set them ten to twelve inches apart, and do not bury the rhizomes deeply; barely under the surface is most satisfactory to the plant.

If you try your hand with this little native, both plants and seeds are available from a number of dealers. If you grow it on your home grounds, set out your surplus plants in the wild and help reestablish it in places where it once was plentiful.

*This is the forty-second in Nature Magazine's series of educational inserts.*

# Cactuses

By E. LAURENCE PALMER

*Illustrations by Betty Burckmyer*

MULE CACTUS

NIGHT-BLOOMING CEREUS

SNAKE CEREUS

MESCAL BUTTON

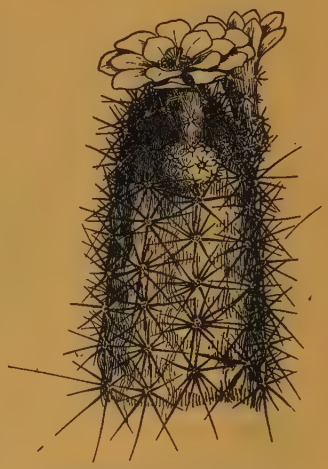
PLEASURE derived from writing these inserts for *Nature Magazine* comes in no small degree from the reactions of hobbyists particularly interested in the subject under consideration. When we wrote about turtles, a young turtle fan wrote of a personal experience that enriched considerably the material included in the insert. When we wrote of sea-shells, we received excellent letters from hobbyists on both coasts, and from wounded soldiers in base hospitals. The insert on seaweeds brought a fiery letter from one who was excited about a mistake our artist had made, and the one on fungi stimulated some delightful comments on editorial offices in general.

Perhaps we may expect equally interesting response to a cactus insert. In any event, the presence of cactuses on the counters of every five and ten-cent store testifies to a public interest in these plants. Besides, there is the vigorous Cactus and Succulent Society of America, whose post-office box is 101, Pasadena, California, and whose members have shown remarkable ability to carry on a popular natural history program and still remain scientific. They offer to buy plants, sell them, classify them, doctor them. They will do everything in their power to establish a happy relationship between you and the group of plants in which they assume you cannot help but be interested.

We have a National Academy of Science in which, it is said, members try their best to present the latest thinking in the field of their specialization in such a way that the other members can understand. It is not certain that they always succeed in this admirable attempt. Would it not be worth while, perhaps, to establish a National Academy of Popular Science, bringing together the more substantial Nature hobbyists, letting each try to convert the rest of the assemblage to a genuine appreciation of the outstanding importance of his own specialty. I can picture some of my conchologist friends giving up their hobby for some of my cactus friends, or either group giving in to the blandishments of those whose consuming interest is in bats, butterflies, fishes, snakes, orchids, willows, palms, thrips, geodes or Indian artifacts. Whatever your hobby may be, there are many people who feel sure that it will fade into insignificance if you will only risk an acquaintance with the cactuses.

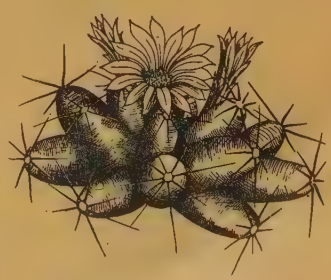
Raised, as the writer was, in the Northeast and in the days before five and ten-cent stores, a cactus was something literally "out of this world" for many, many years. There was a decrepit *Opuntia* that decorated the window of a newspaper office, but it did little to stimulate any real interest in the plants. So it came as a surprise when we learned in high school biology that what we had thought were leaves were really stems. A greater surprise came, however,

SAGUARO



HEDGEHOG CACTUS

COCHINEAL CACTUS



PIN-CUSHION CACTUS

LEMON VINE CACTUS

ORGAN-PIPE CACTUS

HEDGE CACTUS

GOLDEN CACTUS

when we saw our first cactuses growing on some rocks near Washington, D. C. They were neither so big as we had expected, nor were they so terrifying.

These preliminary introductions to cactuses whetted an appetite for more experiences, and when the time came for our first trip through a western desert it is difficult to say whether the cactuses, the road runners or other bizarre organisms of the region held the greatest interest. Later, plenty of opportunities came to wander around among the cactuses at various times of the year, and of the day.

A cactus is, of course, a flowering plant, like corn and apples and roses. A few of them have leaves such as one would expect to find on any self-respecting flowering plant. But it is their stems, and the spines that are borne on those stems, that provide a major interest. Yet a few of the plants do not have spines, and some of these can be grown on land that would not support the plants we ordinarily feed to cattle that provide food for us. And the prickly pear, in some of its forms, may be sufficiently free of spines to be eaten safely by cattle, and may mean economic success or failure to many land owners.

Not a few of the cactuses have fruits that are eaten by man, and some of these are considered in the chart section of this insert. Usually, these fruits must be peeled or otherwise treated to remove objectionable material, and some people do not think that even they are worth the effort. Nevertheless, such cactus fruits do provide a welcome change in diet to many Mexicans, and others whose diet is decidedly limited as to variety, if not in quality. New growths of some of the opuntias may be eaten raw as a salad. Usually, these are peeled, diced, boiled to remove a mucilaginous substance in them and then fried in deep fat. The "nopals" of some of the cook books are made in this way from cactuses. Fruits of prickly pears are more commonly known as tunas. These are processed variously to produce a variety of edible dishes. Such Mexican dishes as *fuesco, miel* and *mecocha* are processed from prickly pears. Cactus candy is made largely from a sugar extracted from such barrel-like cactuses as the species of *Ferocactus*. The candy is not sufficiently intriguing, however, to warrant the destruction of the much more satisfying plants from which it is extracted.

As for getting drinks from cactuses, we find many storybook myths about cactus interiors filled with clear, sparkling water. Apparently, nothing is farther from the truth. A wet mush may be taken from the interior of some of the barrel cactuses, but it would be satisfying ordinarily only to one driven to drink by an all-consuming thirst.

The little cactus known as Indian whiskey cactus packs such a punch that its use in the making of drinks has had to be outlawed. The narcotic effect of the drink taken from this plant causes an almost complete loss of any sense of time, provides the users with remarkable imagination and has a "hang-over" period characterized by prolonged wakefulness. The Mexican drink *pulque* (pronounced "poolka") does not come from a cactus but from agave, a group of plants that yields us a fiber of considerable value. (See insert 26 on fibers.)

Some medicines are taken from such cactuses as *Seleni-*

OLD-MAN CACTUS

ORCHID CACTUS

CHRISTMAS CACTUS

PRICKLY PEAR CACTUS

NIGHT-BLOOMING CEREUS

RAT-TAIL CACTUS

*cereus grandiflorus,* and these are reputed to have a tonic effect on the heart. The first view of one of these plants in full bloom would have a similar effect.

Some of the cactuses produce considerable quantities of seeds, and, where these are abundant, Indians have been known to grind them to form a meal with which they can prepare cakes and other foods. Plenty of cactuses yield products that have been seized upon by culinary cranks to prepare different salads, jams, conserves, pickles and such. One cactus lover remarks that serving up your choice cactus as a salad would be like carving up a household pet as a roast.

The wood of some cactuses is used in making desert novelties, and, where it is sufficiently abundant, it may provide a basis for fire-building material. It is usually easily identified by its lightness and by the regular holes generally to be found in it.

Other practical uses for cactuses include their employment as fencing material. Any plant well armed with spines, as is an average cactus, is likely to discourage any experienced marauder. Aside from the practical effectiveness of a fence of cactuses, they have artistic importance. I can hardly think of the island of Jamaica without recalling fence after fence made of the organ-pipe cactus.

One of the most practical uses ever made of cactuses involved the cochineal industry. Cochineal dye was made from a microscopic insect that lived on a species of *Nopalea.* It provided a startling dye that had the advantage of not being too permanent, and, because of this, demanded replacements that helped make a sustained market. Along came the discovery of analine dyes and a superior product was produced at a much lower figure, and the cochineal industry went on the rocks.

There is every reason to believe, however, that there are more people today interested in cactuses as a hobby than were ever concerned with their economic importance. Of course, there is a commercial value in supplying the needs of hobbyists, but we will not go into that. Suffice it to say that the cactuses provide a splendid field of activity for Nature fans because of their great variety in shape, flowering habits, coloring and so on.

Variety breeds a nomenclature that may be based on shape, color or other characters. We have such cactuses as the barrel, hedgehog, leaf, organ-pipe, old-man, snake, rail-tail, pin-cushion and others. Night-blooming cereus refers, of course, to the flowering habit, and since there are many night-flowering cactuses like *Cereus,* we get into difficulties in describing accurately the plants to which we refer. Hobbyists will find that there is merit in using a scientific name in preference to a common name because the scientific name is usually more stable.

The giant saguaro, so adequately protected now in a National Monument near Phoenix, Arizona, was for years known to scientists as a species of *Cereus.* Then, in 1862, it was placed in the genus *Philocereus.* In 1908, Britton and Rose had the happy idea of giving a generic name to the most outstanding of this group of cactuses and they called it *Carnegiea.* It is interesting to note that twelve years after this the Carnegie Institution of Washington published the four-volume work by Britton and Rose on the Cactaceae. This series of books, now worth about $150, is undoubtedly the most important work on this important family of plants, and one wonders how much effect the naming of a genus after Mr. Carnegie had on getting the support of his institution for this expensive publication. The writer is not enough of a systematic botanist to pass judgment on what happened in this group, though he took his doctorate in systematic botany. Suspicions as to the validity of the judgment, if not of the motive back of the naming of this genus, are strengthened when one reads in Britton and Rose's description of what they call a "monotypic genus" the statement that there are "a number of Mexican and South American species which are taller——." How there could be a number of other species in a monotypic genus is hard to understand.

Possibly, the above discussion may be discouraging to those who might like to explore the scientific names of the cactuses they buy at the five-and-dime. It is doubtful if too much confusion will be found, however. There is no group of organisms that has been studied thoroughly that has not yielded new species and new genera, if we are gen-

(Continued on the last page of this insert)

| COMMON NAME<br>SCIENTIFIC NAME | LEMON VINE LEAF CACTUS<br>*Pereskia pereskia* | COCHINEAL CACTUS<br>*Nopalea cochinellifera* | INDIAN FIG PRICKLY PEAR<br>*Opuntia ficus-indica* | HEDGE CACTUS<br>*Cereus peruvianus* |
|---|---|---|---|---|
| DESCRIPTION | Shrub that becomes a vine, with climbing, woody stems. Stems: to 30 feet long and branching. Related *P. grandifolia*: a shrub or tree, but not a vine. Spines on lower part of stem: 1, 2 or 3 in a group, slender and straight; axillary spines, usually in 2s and recurved. Leaves: to 3 inches long, short petioled. | Height: to 12 feet. Trunk diameter: to 8 inches. Branches: spreading or ascending, with oblong joints, spineless, or the older ones with minute spines; bright green, particularly when young. Leaves: small, awl-shaped and falling off early. Spine-clusters: bear many, small spines and an occasional larger one. | Tree or bush. Height: to 15 feet or even more. Stem: jointed, with units to 15 inches long, oblong or elliptic, thickened, usually spineless, and with a bluish bloom over the otherwise smooth surface. Main trunk: woody, rather cylindrical. Leaves drop off early and are very short. | Tree-like or somewhat sprawling, to a height of 50 feet. Branches: green, to 8 inches in diameter, sometimes smooth, with to 9 longitudinal ribs bearing clusters of 5 to 10, sharp, brown to black spines each to 1¼ inches long. Night-blooming cereus (*Hylocereus*) is a climber, with 3, thin ribs, and spine clusters of to 3 small spines. |
| RANGE AND HABITAT | Widely established in tropical America. Normal range: through West Indies, on east and north coasts of South America, and also grown in Florida and Mexico. Plants in Washington and New York greenhouses bloom rather regularly. Not grown more commonly as an ornamental largely because of its offensive odor. | Original home territory not known, but is found widely scattered in tropical and semi-tropical countries where it was cultivated. Spaniards found it under cultivation by Mexicans in 1518, and transplanted stock to Spain, from whence it spread to India, Africa, the Canary Islands and elsewhere. | Native of Mexico (?) but widely grown in warmer parts of world. Sometimes maintained under cultivation and sometimes escaped and established as somewhat troublesome weed. Over 250 species of *Opuntia,* all native of America; about 90 in western United States. *O. vulgaris* ranges Massachusetts to Florida, and west to Kentucky. | Native of southeastern South America, but widely planted and adjusted to existence in tropical America and other tropical parts of the world, and grown in greenhouses in temperate regions. There are over a hundred species of *Cereus,* all native of South America, though some are now considered as belonging to different genera. |
| REPRODUCTION | Flowers: white, showy, fragrant, sometimes pale yellow or pinkish, to 1½ inch across, in small clusters. Stamens: numerous. Lower part of the pistil: with scale, leaves or spines on it. Fruit: light yellow like a lemon, to ¾ inch in diameter; when mature, smooth and juicy. Seeds: black and somewhat flattened. | Flowers: usually abundant, appearing from the tops of the joints, about 2½ inches long, with scarlet petals and sepals, the petals being somewhat longer. Stamens: pinkish, many and extending about ½ inch beyond the petals and sepals. Fruit: red, about 2 inches long, rarely maturing under ordinary cultivation, as in greenhouses. | Flowers: yellow, to 4 inches across, with showy corolla and calyx blending apparently one into the other, with little differences between sepals and petals. Stamens: much shorter than petals. Fruit: over 3 inches long, red, edible, somewhat top-shaped, bristly, reddish-fleshed. | Flowers: about 6 inches long, white, with a thick tube, particularly abundant on lower part of stem, superficially like a waterlily except that they open at night instead of in bright sunlight. Fruit: globular, slightly fuzzy, about 1½ inch in diameter, with black, rough seeds; inside, fleshy and orange-yellow. |
| CULTURE | Species has been in cultivation in Kew Gardens, England, since 1760; and in others since earlier. In Argentine it is called Sacharosa, but this is not a correct use of this common name. Also known as Barbados gooseberry and West Indian gooseberry. Flowers: fragrant but odor of vegetation is most offensive to some. | Plants are set in rows about 4 feet apart. Cochineal insects, *Dactylopius coccus,* are placed on the joints or branches, where they multiply, and in about 4 months are collected by brushing off into bags. Two to three collections may be made in a year. Cochineal is a scarlet, brilliant dye, now mostly supplanted by analine dyes. | Forms free from prickles are grown as stock food and introduced from the Mediterranean area. Joints are broken and planted in well-drained, light soil 8 feet apart in furrows 12 feet apart. These begin bearing in 3 years and bear regularly thereafter. *O. vulgaris* commonest species in Northeast. | When grown in house or in greenhouse, care should be taken to provide suitable soil conditions and to place plant where temperature conditions are appropriate. These call for good drainage, an average temperature of around 70°F., and a soil that is not too rich, such as can be attained by mixing sand and garden soil. |
| USE | Cultivated in some parts of the world for fruits that have market value and grown as hedge plant and as cover for walls and for some kinds of buildings. Related *P. grandifolia:* common in greenhouse collections and can be distinguished by solitary, straight spines on young growth in place of the recurved pairs. | Microscopic cochineal insects killed by heat from stoves gives the natural silver-gray cochineal, while those killed by hot water provide what is called black cochineal. At one time, (1868) the Canary Islands produced and exported to England some 6,000,000 pounds of cochineal worth $4,000,000, annually. Insect origin discovered 1703. | Fine bristles that cover the fruit can be removed by rubbing with a leaf or cloth. Earlier varieties mature in June and the later in November. To prepare fruit for eating, remove thin slices from each end, slit the skin from end to end and unwrap the peel from the edible pulp inside. | The fruits of many members of genus are edible, but great use for plant is as a hedge and for its beautiful flowers, in spite of fact that these are only about one-half as wide as flowers of *Hylocereus.* Some species of genus are sprawling, vine-like climbers, while others are prostrate. |

| OLD-MAN CACTUS<br>*Cephalocereus senilis* | ORGAN-PIPE CACTUS<br>*Pachycereus marginatus* | SNAKE CEREUS<br>*Nyctocereus serpentinus* | SAGUARO<br>*Carnegiea gigantea* | NIGHT-BLOOMING CEREUS<br>*Hylocereus undatus* |
|---|---|---|---|---|
| Erect columns, usually unbranched and rising to a height of over 5 feet, with trunk diameter to 1 foot. Branching, if present, is more likely at top, but may rarely be at base. Ribs: 20 to 30, of large wart-like units; with a head of long gray bristles, and with basal spines to a foot long. | Height: to 25 feet. Stems usually erect and unbranched. Ribs: 5 or 6, usually sharper in the younger plants, and much blunted with age. Spine clusters: closely crowded, their wool forming a dense cushion along the ridge of each rib. Spines: in a cluster, 5 to 8, with the center one conspicuous. | Stems: grow in clusters that are at first erect, but eventually clamber or hang, and reach a length of nearly 10 feet, with a diameter of not over 2 inches. Ribs: 10 to 13, low and rounded. Small areas on the surface: crowded, felted, with sharp or bristle-like spines that are to an inch long. Tips of spines: usually darker than remainder. | Height: to 40 feet. Composed of erect, cylindrical columns to 2 feet in diameter and unbranched, or up to 12 branches, the branches parallel to main trunk. With to 24 vertical ribs, each blunt and to over 1 inch high. Spines of two kinds, those above being yellow-brown; the lower ones, stouter and to 3 inches long. | Climbing. Stems adhere to walls, trees and similar supports by aerial roots, often to 40 feet long, green, with 3 ribs, thin and with a horny margin. Spines: short but effective, arranged in groups about 1½ inches apart and with 1 to 3 or 4 spines to a group. Whole plant may twist and wind around its support and branch freely. |
| Native of Mexico, where it is found wild in Hidalgo and Guanajuato, particularly on the limestone hills of eastern Hidalgo where it may be the most conspicuous plant on the landscape. At least 48 species known in the genus, but this is probably the best known and most widely distributed. | Native of Mexico and found wild in Hidalgo, Queretaro, and Guanajuato. Widely established in Mexico, Jamaica, Cuba and similar areas, where it is grown deliberately, or occurs as an escape from cultivation. There are at least 10 species of the genus recognized, all native of Mexico or of southern California. | Native of Mexico, probably from near the eastern coast. Not now known from the wild state but is widely cultivated and has escaped from cultivation in many areas. There are about 5 species of the genus supposedly native of Mexico and Central America of which this species is the one most widely cultivated. | Found in Arizona, southeastern California and in Sonora, Mexico. Known to science since 1848. There are some related Mexican species in other genera that are larger and would weigh more, of which *Lemaireocereus weberi* is considerably taller and stoutèr. J. O. Pattee was first Anglo-Saxon to see this plant. He saw it in 1825. | Native of Mexico but established in the tropics and sub-tropics generally as an ornamental and in greenhouses the world over as an interesting decorative plant. It is listed in literature as *H. tricostatus* and as *H. triangularis*. Other genera considered popularly as cereus are *Selinicereus, Aporocactus* and *Echinocereus*. |
| Flowers: numerous, to 4 inches long, red outside and rose within, with the tube bearing few scales. Fruit: egg-shaped, to 2 inches long, bearing at the top the base of the flower, which has a few scales and hairs still attached, violet. Seeds: black. | Flowers: funnel-shaped to under 2 inches long, including the supporting ovary. Tube and ovary: rough scaly, and often with bunches of wool and small spines at edge of scales. Fruit: globular, over an inch in diameter, covered with wool and spines that drop off at maturity, not particularly fleshy. Seeds: numerous, black and shining. | Flowers: borne at upper ends, sometimes literally terminal, white, to 7 inches long, to 3 inches wide, with tube and support exceptionally bristly, funnel-form. Pistil and stamens: of about same length. Fruit: red, covered with spines that drop off easily, to 1½ inches long. Seeds: black, rather large for such a small cactus fruit. | Flowers: to about 4 inches long and sometimes as broad as they are long, supported by a green-scaled, white-felted tube that is about 3/5 of an inch long and about an inch wide at the throat. Stamens: white (one flower had 3482). Pistil: white or cream-colored, to over 2 inches long. Fruit: red or purple, edible, ⅛ inch berry, with to 2000 seeds. | Flowers: about 1 foot long, with yellowish-green outer segments that turn backward and the numerous center ones erect. Abundant stamens: cream-colored. Whole flower looks like an enormous white waterlily superficially, and is fully as fragrant. Fruit: red, scaly, except when young, when it is smooth, edible, oblong, to 4½ inches through. |
| Young plants: covered with long, white silky hairs, giving the plant its name. Large plants rarely seen, though small plants are one of commoner popular cactuses for those who grow them as house plants. Little wood tissue, and largest may be cut down with a pen knife with ease. | Figures in lore of areas in which it grows, in part because it usually separates the terrain occupied by different families of natives. Properly cared for, it can provide an impenetrable hedge that is not unattractive, and, because of its spines, it is effective even though there are apparent openings at intervals. | Known as night-blooming cereus as are a number of other cactuses here considered. May be propagated by making cuttings from new growing areas. These plants can make an old rock pile attractive since they climb in and over the units and eventually burst into bloom at night. It is known in Mexico as junco or junco espinosa. | Fruits: eaten by Indians. There is a National Monument of 2000 acres of desert land 9 miles outside of Phoenix, Arizona on a rocky hillside where these plants will be forever protected. Largest individuals are considered to be to 200 years old. Plants 4 inches high, 10 years old; 3 feet, 30 years; then add 4 inches a year. | Flowers: appear at night remaining open until dawn. May be picked and kept open in an icebox for some time. It flowers in homes and greenhouses as far north as New York. Of the 16 species of the genus, the one here listed is undoubtedly the most popular as an ornamental or as a wall cover. |
| Great quantities of the small plants have been shipped to Europe and to other parts of the world for sale to cactus hobbyists. Old plants have weak, gray bristles at base that are a foot long, but such plants are not often seen except in the native areas. | Around estates and the lands of the poor, this plant takes the place of the old stump fence or stone wall in rural northeastern United States or of the wire fence area of today. It has a type of beauty not possessed by any of these devices. In its native area, it is sometimes called "organo" in reference, of course, to the organ-pipe like stems. | The scientific name, of course, means night cereus and because of this might claim for the genus priority on the night-blooming cereus common name. However, its common name of snake cereus is even more appropriate and it will probably be the name by which it is known by most people. | Primitive peoples used heavy rods from stems for building construction; fruit and seeds, for food and drink. In wet seasons, plant may be 98% water most of which is lost in May and June. Woodpeckers burrow into the trunks and pygmy owls nest in abandoned woodpecker holes. Wounds in rainy seasons may become badly infected with bacteria. | Until one has the opportunity to observe a hedge of this in full bloom he has not been able to get one of the real thrills that comes to a Nature lover in the tropics. Commercial reproduction is largely by cuttings and rooting the slips in sand. |

| COMMON NAME<br>SCIENTIFIC NAME | NIGHT-BLOOMING CEREUS<br>*Selenicereus pteranthus* | RAT-TAIL CACTUS<br>*Aporocactus flagelliformis* | HEDGEHOG CACTUS<br>*Echinocereus polyacanthus* | MESCAL BUTTONS<br>INDIAN WHISKEY<br>*Lophophora williamsii* |
|---|---|---|---|---|
| DESCRIPTION | Trailing or climbing plants, but relatively stout, with stems to 1½ inches or more in diameter. Stems: blue green to purple, conspicuously 4- to 6-angled, with the ribs on the younger branches to 1/6 inch high. Spines in clusters: 1 to 4, short, dark, rarely over 1/8 inch long but effective at that. | Slender, vine-like creeper that twists and turns over its supporting tree or wall, or sometimes hangs suspended from such a support. Stems: weak and rarely over ¾-inch in diameter, with 10 to 12, low, inconspicuous, somewhat warty ridges and well supplied with clusters of many brown spines. Has aerial roots. | Height: a few inches, 5-inch plants bearing flowers. Stems: cylindrical, but narrower towards top, making whole thing somewhat like a typical plump cucumber. Stems: often grouped to make a mass. Ribs: 9 to 13. Radial spines: stout, 8 to 12, lower one longest, being to about 1 inch long; upper, ½ inch, white to red and dark tipped. | Globular. To 3 inches in diameter arising from a coarse taproot extending to a depth of 4 inches or more. Ribs: 6 to 13, nearly vertical, or irregular and indistinct and composed of a series of tubercles each of which is crowned with a delicate bunch of spines; dull, bluish green. |
| RANGE AND HABITAT | Native of Mexico, but known mostly from conservatories, where it has long been a most popular species. Probably commonest of conservatory-grown night-blooming cereus plants. There are 16 species in the genus ranging from southern Texas to South America, one extending down to the Argentine. | Native of Mexico, Central and South America. It was reported to have been found growing wild on trees on the coast of Jamaica, but has not been known wild from that island in recent times. It is best known in temperate regions from greenhouses and sometimes as a house plant. Five species of the genus. | Found native from Chihuahua and Durango in Mexico to western New Mexico and southeastern Arizona. Described in 1848 by Engelmann, but confused in its classification for some years. Now found rather commonly in cactus collections together with the purple-flowered *E. pectinatus*, the true hedgehog cactus, *E. engelmanni*; rainbow cactus, *E. regidissimus*. | Found from central Mexico through southern Texas. Looks so much like mushroom that it has been considered to be one by some, and bears common name of sacred mushroom, as well as a host of other names. There seems to be but one species in spite of fact that some writers consider there are two. |
| REPRODUCTION | Flowers: to a foot long, 15 inches across, white, very fragrant, the tube and throat about half length of flower and swollen in upper part. Lower cluster of stamens: attached to petals tube for about 3 inches. Fruit: red, globular, about 2½ inches in diameter, covered with long white, silky hairs or bristles. | Flowers: to 3 inches long, pink to crimson, with the outer segments more or less bent backwards, and the inner spreading only slightly, and with all of these parts relatively narrow. Stamens: in somewhat of a tube that is terminated by the yellow anthers. Fruit: to ½-inch through, red, bristly, globular, with yellow pulp. | Flowers: scarlet to salmon, 2½ inches long, lateral but held erect, with a funnel-form base and wide-spread showy parts. Flower-tube: yellow and the spines on the flower base well intermixed with a cobweb-like wool. Fruit: spherical, about 1 inch long, spiny, greenish-red, uncommon. Some authors claim fruit is unknown. | Flowers: found at the top of plant, white, to 1 inch across when fully opened, surrounded by a mass of relatively long hairs, the outer flower parts being greenish on the back and somewhat swollen at the tips. Stamens and the pistil much shorter than the surrounding parts. Fruit: under an inch long, naked, pink. Seeds black. |
| CULTURE | Flowers open in night and produce remarkable effect because of their beauty and fragrance. Some species are reported to have medicinal value, but beauty and fragrance of flowers should have a therapeutic effect on most confirmed of pessimists. Not surprising that flowering time is announced in the papers. | Flowers: remain open or go through opening process for 3 to 4 days. In Mexico, the dried flowers are sold as a household remedy under the name of "flor de cuerno," and this is sometimes found in drug markets under the same name. It is a common window plant in Mexico. | Fruits of some of members of genus are edible, the spines that cover them being easily removed when fruits have become mature and skin being unusually thin. Seeds: black and bear small tubercles in most of members of genus. Some 60 species known in genus of which nearly one-half are grown as ornamentals. | Yields the narcotic anhalonin, although the narcotic effect may be caused by resins. Drug causes persons using it, in drinks or otherwise, to lose all sense of time, as does hasheesh from *Cannabis indica*. Drug users also have remarkable visions. Its use dates to pre-Columbian times and is forbidden by law. |
| USE | A plant that can be grown in a 10-inch pot and produce flowers that may be 15 inches across across is bound to hold interest of almost anyone. Related *S. grandiflorus* yields a heart tonic extracted from the green branches and originally discovered in Naples in 1889. The medicinal agent is probably an alkaloid. | Apparently, was introduced into Mexico from Peru about 1690, but it is not known in a wild state anywhere at present time. Mexicans frequently plant it in the open end of a cow's horn and suspend this on the outside of the house where the plant does well. Flowers from mid-December to mid-January. Easily grown. | Some members of the genus have sprawling stems. In this species, the small scarlet flowers separate it from many of other common species whose flowers are crimson or purple but not scarlet. In *E. pectinatus*, there are several central spines in spine group; while in *E. rigidissimus*, there are none. | Indians used the plant in "breaking fevers" and in religious rites. Plants are cut and dried to make "mescal buttons." Indian names include xicori, pellote, peyote, peyotl, hiculi, camaba, seni, huatari. A "spree" with the drink is followed by a long period of wakefulness. |

| MULE CACTUS<br>*Ferocactus wizlizeni* | GOLDEN CACTUS<br>*Echinocactus grusonii* | ORCHID CACTUS<br>*Epiphyllum ackermannii* | CHRISTMAS CACTUS<br>*Zygocactus truncatus* | PIN-CUSHION CACTUS<br>*Mammilaria (Dolichothele) longimamma* |
|---|---|---|---|---|
| Height: to over 6 feet. At first, almost spherical but when mature forms a cylinder. Usually unbranched but if injured may bear several heads or branches. Ribs: to 25 or more, about an inch high. Spine groups: with one, central, strongly-hooked spine surrounded by many smaller ones and by brown, felty areas. | Large balls. Sometimes, to nearly a yard in diameter, unbranched. Ribs: from 21 to 37, thin and high. Spines varying in color from golden-yellow when young, to pale or even white, and, finally, to dirty brown; with the radial spines, to over an inch long and the usually 4 central spines up to 2 inches long. Plants usually growing singly. | Stems: many, to over 3 feet long, somewhat recurved, with branches that are, for most part, under 1 foot long, unarmed, with middle and side ribs. With short bristles on the younger and the lower portions. The flat, 2-edged branches have margins that are waved or shallow-toothed, as in some leaves of other plants. | Plant hangs in large bunches from trees and similar supports. Stem: flat, with joints 1 to 2 inches long and ¾ to 1 inch wide, thick, green, soft, blunt at tip of each joint; with upper part of each joint more or less curved inward like a blunt horn. Whole stem: relatively weak, and somewhat succulent. | Form: rather large clumps of tubercle-like structures, each to about 2 inches long and terminated by a circle of about 6 to 12 spines, each about 1 inch long, with whitish hairs when young but naked with age. Spines: arranged like the spokes of a wheel and sharp, white or pale yellow. Whole plant takes a general dome shape. |
| Found growing wild from El Paso, Texas, through southern New Mexico and Chihuahua to Arizona and Sonora, and possibly on to Lower California. Reported, probably erroneously, as from Utah. There are some 30 species of the genus, all globular or cylindrical, and all with well-developed, straight or hook spines. | Native of Mexico and is found wild from San Luis Potosi to Hidalgo. It is a popular plant in collections maintained by hobbyists and by greenhouse operators. The genus, has at least 9 species of which this is probably the best known. The other species lack the bright yellow spines that give the group its common name and its popularity. | This is not known in wild state, though most of other members of genus come from Mexico, Central America, and northern South America. By some writers, this is considered a hybrid and not a natural species. It was originally described from material sent by Ackerman from Mexico. It may represent *Epiphyllum* and *Heliocereus*. | Native of Brazil. Many of the cultivated forms found in houses and greenhouses are hybrids of different species of the genus, or hybrids of these with forms of *Cereus* or of *Epiphyllum*, the last of which is normally found growing on trees as does the typical Christmas cactus. | Native of central Mexico. Cultivated to some extent for unique ornamental qualities. At least 150 species known, of which nearly 1/3 are considered of importance as ornamentals by hobbyists. |
| Flowers: to 2½ inch long, yellow, supported by green-scaled, tubular base. Some flowers may be reddish or orange, borne only on younger growth just above spine clusters. Stamens: very numerous, borne in throat of flower and much shorter than the showy parts of the flower. Fruit: to 1½ inch long, yellow, oblong. Seeds: dull black. | Flowers: red and yellow, borne at the top and center, to 2½ inches long, and opening fully only in bright sunlight. Stamens: yellow, numerous, forming a cylinder. Pistil: yellow, divided at the top into 12 lobes. Fruit: spherical, bearing pointed scales, with an abundance of wool in their axils, to ¾ inch long. Seeds: blackish, smooth and shining. | Flowers: to 6 inches across, blooming in the daytime, flaming red or scarlet outside and carmen within, with a greenish-yellow throat and very short tube. Tip of pistil: pink. Flowers closely resemble those of *Heliocereus*, a genus not here considered. Lower part of pistil is more or less bristly. | Flowers: solitary growing from the ends of young joints, showy, magenta red, 2½ to 3 inches long, with calyx and corolla alike and composed of many curled-back segments. Stamens: many, with long, pink filaments. Fruit: pear-shaped, red, to nearly ½ inch in diameter. | Flowers: lemon-yellow, with many pointed, petal-like parts surrounding shorter stamens and pistils that are crowded to center. Whole flower: to over 2 inches across, and borne in the woolly axils between the tubercles. Fruit: nearly smooth and berry like. |
| Grown as an ornamental to some extent. Related *F. glaucescens* is smaller and has no curved spines. Usually, the pictures showing a Mexican drinking water from a "barrel cactus" represents a plant of this genus. It is doubtful if the plants can be considered a source of water except in case of dire need, and then the amount will not be abundant. | Woolly crown; woolly, thin-skinned fruit and smooth seeds are characteristic of the genus; the golden spines, of the species. It is one of the most popular plants for collectors, but large specimens are not commonly seen. The plants may bloom at 6-month intervals through the year, beginning about mid-May. Flowers will open in 3 days under good condition. | Culture of plant is usually by cuttings and rooting of the sections in suitable earth. Some prefer to cover the young shoots with glass until they get a start, and bottles with the base broken off may serve this purpose well. | Flowering time: late winter. Commonly reproduced by stem cuttings. Ideal soil: about 2/3 garden soil and 1/3 sand, with good drainage. Should be placed in a sunny window where it will not be disturbed, provided with water sparingly except at blooming time, and kept at temperature between 60° and 70°F. to be at best. | These bright green spiny cushions are relatively common in greenhouses. In the southern part of the United States, may be grown outdoors where soil conditions are suitable. Some species of the genus may be found in flower from March through November. |
| While the interior may consist of a moist pulp, it is not filled with clear, cool water, as some writers or publicity agents would have us believe. The plants have a unique beauty that should justify their continued protection. Small plants are grown indoors by hobbyists quite commonly. *F. ancanthodes* is the barrel cactus, and *F. johnsonii*, the devil's big toe. | New plants are obtained from seeds, or a large plant is cut off at top, stimulating development of buds that are removed and started as new plants. Flowers: sunken rather deeply in stem and surrounded by felt cushion so that to be collected they must be actually dug out of surrounding tissue. | One of at least a half-dozen of genus that have long been popular as house plants and in warmer parts of the country as outdoor ornamentals. Name, of course, means "on leaf" and no doubt refers to the fact that the flowers appear on what seems to be the leaf, though it is really the stem. | After the house plant has bloomed, water should be withheld for some time. Plant should be kept in same pot for years without changing; usually, the pot has much broken "crockery" in it. Plant responds to treatment and unless used sensibly may be disappointing instead of an outstanding delight. | Species commonly grown for flowers include *M. albicans, M. bocasana, M. camptotricha, M. elegans, M. elongata, M. hahniana, M. hemisphaerica, M. microhelia, M. parkinsonii, M. parbella, M. rhodantha* and *M. trichacantha. M. macdougalii* known as pin-cushion cactus, *M. fragillis* as thimble cactus, *M. dioica* as candy cactus, and *M. plumosa* as featherbed. |

erous enough in our definition of what these groups may be. There will always be systematists who wish to get their names in print after a name, or who have other motives for describing a new genus or species. Some of these are simply too lazy to look up the literature, or to examine collections to be sure that what they think is new has not already been described by someone else and cannot therefore be named again. This is all a part of the game of taxonomy in the field of biological science. There are those who think that it is the most important of all sciences, and they have arguments to prove it.

The Cactaceae include more than a thousand species of plants of the order Opuntiales, so there is plenty of room for a number of specialists to work on the group. It is suggested that amateurs begin to get a general picture of the more important groups, and then to explore whatever group offers the greatest appeal or the greatest opportunity for study.

There is a rich literature on the group, but amateurs will find *Cacti for the Amateur* by Scott E. Haselton, published by Abbey Gardens Press, Pasadena, California, in 1940, a most welcome introduction. In this book there are abundant suggestions for caring for the plants, transplanting them, doctoring them and studying them. It should be in every cactus fan's library. *The Cactus and Succulent Journal,* also published in Pasadena, should serve to keep hobbyists up on the latest developments. If one has the money or the opportunity to have access to Britton and Rose's *The Cactaceae,* published by the Carnegie Institution of Washington, D. C., he will have the most exhaustive study that has been made on this group. Unfortunately, its keys are based largely on the flowers or fruits, which are usually conspicuous by their absence. Here is a chance for someone to come to the aid of all good cactus fans and bring out with a monumental work on cactuses with emphasis on their vegetative characters. We might suggest, as an initial step, the naming of some conspicuous or useful cactus after Guggenheim.

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# Inserts to Date

THIS, the forty-second in this series of special educational inserts, rounds out this representative and useful group of Nature features. The series will, of course, continue, but a listing of the inserts that have gone before is in order for the benefit of readers and users. With the exception of inserts Numbers 30, 32 and 40, which have been entirely sold out, individual copies of these features are available. Single copies sell for twenty cents each; ten or more copies for fifteen cents each; fifty or more copies for ten cents each, and one hundred or more copies for five cents each. They may be ordered by number from Educational Department, American Nature Association, 1214 16th Street, N.W., Washington 6, D. C.

1. Some Common Fresh-Water Insects
2. Weeds Above the Snow (Common weeds in winter)
3. The Sky at Night (Star guide)
4. Some Common Reptiles
5. Some Common Food and Game Fishes
6. Some Common Rocks and Minerals
7. Domestic Mammals
8. Some Common Marine Animals
9. Upland Game Birds and Waterfowl
10. Atlantic and Gulf Coast Shells
11. Nuts (Story of common nut trees)
12. Our Fur-Bearers
13. Deserted Deserts? (Desert life)
14. Marshes and Their Environs
15. Weed Patches and Waste Places
16. Our Fruit Stores (Story of fruits)
17. Circus and Zoo (Animals in captivity)
18. Rooting in the Root Cellar (Edible root crops)
19. Let's Pray for the Preying Birds (Hawks and owls)
20. Our Feathery Plant Friends—The Ferns
21. The Spirit of Fall Flowers (Fall gardens)
22. Along Came a Spider (Story of spiders)
23. Hello! Do You Hear Me? (Bird and mammal sounds)
24. Some Western Birds
25. Living Out (How to live outdoors)
26. The Tie that Binds (The story of fibers)
27. Evergreens Forever (Common evergreen trees)
28. Your "Yarb" Garden (Herbs)
29. A Universal Star Chart
30. Some Common Amphibians (Out of print)
31. Cereals and Kindred Grasses
32. Some Eastern Birds in Winter (Out of print)
33. Some Eastern Ornamental Trees
34. Pacific Coast Shells
35. Some Common Mushrooms
36. Household Enemies on the Home Front (Insect pests)
37. He Who Runs May Read (Animal tracks)
38. Seaweeds
39. Spring Flowers
40. Shore Birds (Out of print)
41. Some Butterflies and Moths
42. Cactuses

# A Set-up for a Tea Party

When, in January, 1935, the Massachusetts Supreme Court sustained the constitutionality of the Bay State billboard regulation law, the Court declared that the outdoor advertisers "are not exercising a natural right. They are seizing for private benefit an opportunity created for a quite different purpose by the expenditure of public money in the construction of public ways and the acquisition and improvement of public parks and reservations." The decision further recognized "the right of the traveler upon the highways to a peaceful and unannoyed journey." The Court also declared: "Considerations of taste and fitness may be a proper basis for action in granting and in denying permits for locations for advertising devices."

Together with these significant affirmations, the Court upheld completely the most important billboard regulatory statute enacted up to that time. It sustained the principle of setbacks from the highway in proportion to the size of the billboard; upheld the right of communities to zone billboards within their geographical limits; set a model for other States to follow.

With this decision the Outdoor Advertising Division of the State Department of Public Works undertook the administration and enforcement of the law. Conditions along the highways improved somewhat, particularly so far as small and unorganized designs were concerned. Degeneration soon set in, however, and sabotage really began when James Michael Curley, spending one of his enforced vacations from the job of Mayor of Boston in the Governor's chair, brought with him the influence of a son-in-law who headed the largest billboard company in New England.

Since that time the official interpretations have belied the intent and weakened the purpose of the law. The Outdoor Advertising Division has, for example, held that if there is one business establishment within 300 feet on either side of a desired billboard location, that location is a business district, and a board may be erected without setback. Thus a temporary rural stand used to sell garden produce in season has often been seized upon as a business district, and the 300 feet have been stretched to 500 and more. Protests of illegal boards by communities have been consistently ignored.

Conditions became so baldly bad, and the domination of the outdoor advertising industry so obvious, that protests from civic groups could no longer be ignored. So the Massachusetts Legislature adopted one of its favorite devices and created a Recess Commission to study the matter. Notices of the first public hearing of this body were carefully sent to twenty-one billboard companies, but to only one group interested in billboard law enforcement. Demands that this policy be changed were at first refused, then reluctantly met.

At the hearings the billboard company representatives confined their testimony largely to the industry's contribution to the war effort, and to the number of people it employs. Such remarks as "billboard advertising has nothing to do with garden clubs and planners," and "it is highly unreasonable to allow towns to regulate billboards" indicated the viewpoint of the industry's representatives and their defiance of the public interest or wishes. Proponents of enforcement presented ample evidence of illegal boards and laxity, if not downright subversion.

Finally the Recess Commission reported, admitting lax administration and recommending creation of an Outdoor Advertising Authority. Charting the way for this group, and revealing the penetration of the industry into the deliberations of the Recess Commission, the report recommended a policy that "a business area is an area which is commercial, industrial, marketing, mercantile or on unrestricted commercial arteries and adjacent to commercial enterprises." This takes in the widest territory imaginable, and leaves the door wide open for the erection of billboards without setbacks. Equally wide open is the suggestion that the rules be amended "so that in case of undue hardship or unusual circumstances or for other good causes the proposed Authority may grant a permit for a special size display outdoor advertising unit in a particular location." Sky the limit!

The Commission's recommendations were enacted into law, the Authority established, and the Director of the earlier Outdoor Advertising Division made Executive Director of the new agency. This Authority will not only administer the law, it will make it, which seems to indicate that Massachusetts is now infected with the virus of law by executive and administrative decree. The findings of the Authority are final. It cannot change the situation of any location "with respect to which a license or permit has been granted," thus perpetuating the unjust interpretations and questionable practices of the former administration. *Tide*, the advertising magazine, comments: "Of course under the Massachusetts act, the Authority has complete control over the regulations and thus over the industry itself, but Edward C. Donnelly isn't worried about that."

As the leading figure in the billboard industry in Massachusetts, Mr. Donnelly may not be worried, but the people of the Bay State have a history that indicates that they can be kicked in the teeth only so long before they set about to do something about it. Tea was once tossed into Boston harbor, a fact upon which Mr. Donnelly might reflect.

# Which Way to Nature?

*By* WINIFRED DUNCAN

*Illustrated by Lawrence D. Conway*

★

**The flower seeds all behaved strangely, none performing as promised on the outside of the seed packet. One larkspur soared up, developed a stiff spire of buds, and never bloomed; another gave five leaves to the world and died; another grew like a tree. All developed a personality.**

EVERYBODY, we presume, has at some time, at least in his semi-conscious mind, harbored a secret resolve that, some day, he will quit whatever he is doing and withdraw from the vile world of competition into the soothing and non-acquisitive world of Nature.

Many of the people who have taken this plunge, and have disappeared from our ken, have further surprised us by bobbing up again, encircled by their new hobby as by a life-preserver. Some are actually making money out of it, so habitual is our acquisitive nature.

A retired banker, withdrawing into a cellar, may reappear as a mushroom fancier; a disappointed author, going off to live with hens, may emerge as a flourishing poultry merchant; a maiden lady, buying a little cottage with garden, far from the madding crowd, may appear again selling orchids at ten dollars apiece.

But when my turn came to say "goodbye, proud world, I'm going home," my motives were far purer. My ambition was a clean, abstract contemplation of Nature, unsullied by any financial motives. The world of flowers, insects, protozoa, birds, would, I thought, entirely satisfy my declining years.

Living in Mexico, I thought I had chosen the line of least resistance when I began with flowers. There flowers seemed to sprout unassisted out of lamp posts, and I had a nice little plot of mingled grass and mud just waiting for them.

Trotting rapturously to the nearest seed store, I bought five packages containing—so it said on the wrapper—nasturtiums, mint, snapdragon, larkspur and digitalis. The mint was to be for salads; the digitalis for heart disease—in case I ever got it; the larkspur for beauty, and the snapdragons, which I really detest, to satisfy a childhood longing to see them snap.

I spent a happy day planting the seeds, and, at twilight, presented my ruined fingernails to a stout manicurist from Sweden, who, having a garden of her own, informed me that Mexican seeds are no good and I should have sent to the States; that you do not plant seeds in the earth but in special boxes; that Mexican soil is completely barren unless constantly fed with nitrates, phosphates, silicates, bicarbonates and other horticultural shots in the arm. But I was still in a carefree mood, and said, "Nonsense, look at the wild flowers."

Nevertheless, the next day I bought a book on gardening, with a lovely picture of flowers on its outside. It was nasty inside, however, devoting much attention to bone-dust, manure, arsenic, cut-worms and fat white grubs. I exchanged it for a book about Burbank, which I found far more inspiring. Indeed, I decided, when the time was ripe, to cross the mint with the larkspur, and the snapdragon with the digitalis, just to see what I would get.

My creative faculties were now fully aroused. I hovered like a moth over my potential garden, staring for hours at the dull earth. I even got up in the night with a flashlight to sneak up on my embryos, because I had heard that things grow at night. And, on the fourth night, they did grow. Bristling like hairs in the dark earth, little, green, furled spikes actually had arisen out of the soil. It must fertile!

**Meanwhile the weeds behind the rubbish heap, enjoying no fertilizer, no watering and no love, flourished and bloomed and were starred with beautiful flowers.**

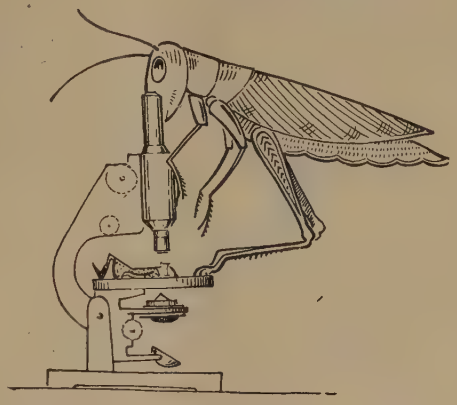
This crop grew by leaps and bounds. It all looked alike at first, but my mind's eye saw each spikelet in full bloom, and I nursed them with a mother's care. They could not tell *me* it was impossible to raise things right out of the ground!

Cats provided the first cloud on the horizon. My pet Maltese had two boy friends. They discovered this soft, rich bed of loam and thought it a good setting for prolonged night-work. Four-toed footprints mashed six of my babies to the ground! What to do? Build a tent over the entire plot? Expensive! Surround it by chicken-wire five feet high? Ugly, and chicken wire was six pesos a yard. Pepper? I sprinkled it and the cats adored it. Then, with the help of a ladder, I climbed the nearest palm tree, hacked off all the sharp-pointed dead leaves and planted them in the garden, like Perseus sowing the dragon's teeth. That worked.

Two days later a friend came to tea. I showed her the garden. "This," I said, "is going to be larkspur, and those little delicate things in the rear are my digitalis."

She looked at me attentively.

"My poor woman," she said, "you have been cultivating weeds; flower-seeds do not come up three days after you plant them. Pull all these out if you expect a garden."



**Grasshoppers would peer at the author as though they wished they had her under a microscope lens.**

I pulled them out, but I planted them again behind the rubbish heap. I had grown fond of those weeds.

Sure enough, at the end of two weeks the nasturtiums and the mint put in an appearance. No digitalis and no larkspur.

"You probably planted them too deep," said my friend. "Or not deep enough. All you can do now is to wait."

I found this waiting a trial. I had not known that Nature was so slow. At the end of a month Mint and Company was only one inch high, and friends would stare at the mud-plot and say, "Why did you dig up all that nice grass you had there?"

Exhausted with watchful waiting, I compromised and bought a box of prepared fertilizer. Miracle! Everything began to grow like mad, and the larkspur and digitalis fairly leaped out of the earth.

Now every morning I arose at a ghastly hour, before the sun was hot, and played a fine spray from the hose over my offspring. Their little leaves sparkled in the sun. My friend, catching me at it, said, "Never spray leaves. They don't absorb moisture. In fact, never spray at all. It washes out the soil. You should irrigate."

There was another school of thought that said never irrigate; spray, irrigation rots the roots. I tried both methods, on alternate days. I wanted to play fair.

The digitalis, which the botanical dictionary said was a tall, spiring plant with finely bifurcated leaves, came up squat and flat, with leaves the size of soup plates. At the end of the second week it looked like a cabbage; at the end of the third it died.

"Too much sun," said my friend.

The mint, which had begun bravely, suddenly shrank, and put out leaves the size of shoe buttons.

"Too much shade," said my friend.

Then the four larkspurs began to behave strangely. Planted on the same day, in the same soil, and out of the same package, they suddenly developed personality. One soared straight to heaven and had a stiff spire of buds, which never developed into flowers. The next one had no flower at all, grew one foot, and put out branches like a tree. The third gave five leaves to the world, turned bright yellow and died. The fourth bloomed, one month after all the others had given up.

The nasturtiums, assisted by fertilizer, put forth round, thick, juicy stems as big around as my thumb. They had bunches of little leaves the size of pennies at the ends, and produced no flowers, only a large and happy crop of bright green worms.

In the meantime the weeds remained behind the rubbish heap, and, as I had forgotten all about them, had had no water, no fertilizer, and no love. But they had grown into bushes three feet high, and were starred with beautiful flowers. I was now informed by kind friends that the best thing to do with the digitalis was to bury it, and that if I would cut the larkspur down to two inches above the ground, the stumps would grow again and have a spire of flowers the next season—maybe.

I said I was tired of watering, watching and worrying. I would try some other form of Nature study, one in which I could sit down and keep my fingernails clean.

So I now turned my attention to Protozoa. But for this I needed to have a microscope, and there were no microscopes to be had. The United States Government had bought them all for the war. After scouring the city pawnshops in vain, and vainly begging busy biology professors to rent me theirs, I put an ad in the paper, two weeks running: "Wanted: A man with a microscope."

This resulted in several ribald telephone messages from my friends, and two invitations to be met in the park after dark, these last delivered in velvety Mexican male voices. When I explained that I was more than fifty, and really wanted a microscope, they rang off.

So I compromised by buying a jeweler's magnifying

glass, which is death on the eyes, and a quart preserve jar. I was soon seen by the interested populace of Mexico City squatting, at all hours, over open sewers, slowly lowering my bottle, with a string tied around its neck, into the slime. On one side of me was a pail, on the other side an old window curtain for netting larger fauna.

As the Mexican street cars refused to admit me with this suspicious paraphernalia, I had to hire little boys to carry the pail. The news spread that there was a *gringa, loca,* but with *baksheesh,* and I strode through the streets looking like a youth movement.

The glass bottle proving wholly inadequate for observation purposes, owing to its curved sides, which turned everything double, I now had to buy a glass aquarium, at enormous expense. Then, as my protozoa had to eat, I repaired to the artificial lake in the park, removed shoes and stockings and dredged up to my arm-pits for algae and water plants. My audience included more little boys, twenty or thirty interested Mexican adults and a policeman, who took down my name and address.

**The author discovered that the best way to observe Nature was to pay no attention at all and make plenty of noise. Animals seemed to resent spying.**

By now I had secured the services of a scientist with a microscope, and when the mud in the aquarium had subsided, what a world of wonders! Putting a drop on the slide, my teacher would find a protozoon, and, leaping aside, cry, *"Now Look!"*

By the time I had looked, the protozoon had swum a millionth of an inch and there was nothing there. After ten minutes of his traveling around in that drop of water, I would see him for one instant, but he usually saw me first. But it was great fun, and I began discovering things by myself overnight and keeping a diary. I made a page of passionate notes on an interesting black cocoon, which turned out to be the droppings of a snail, and did considerable scientific research on some little, wiggly, transparent beings, which turned out to be floating cells in my own eyes. When I did, finally and all by myself, find a fat paramecium, I instantly turned the nose of the microscope down and squashed him.

Then I graduated from protozoa, proper, to the hydra and the flatworm, that charming creature that looks like a mean New England spinster with her eyes too close together. The flatworm married, presently; or divided; or budded—anyway she had thirty-five black babies, who teamed up to eat the hydra.

Then there appeared, overnight, three hundred transparent shrimps. They rode around in a frenzied manner on each other's backs, and ate all the flatworms. I spent anxious hours fishing the shrimps out with a teaspoon, but the next morning they were thicker than ever.

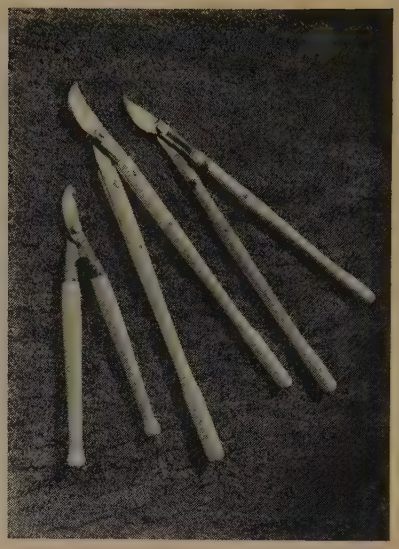
Frustrated, I decided to study larger and less perishable fauna, so I turned my attention to vertebrates. There was a nice black lizard with a blue throat living on a stump in my garden. With the scientist at my elbow I had watched it eat, mate, fight and contemplate the universe. So, with my scientist away on a trip, I now sat for hours, well hidden, I thought, watching the stump and feeling scientific. The lizard came out once, looked at me in a hostile manner, retired and never appeared again. I caught and killed flies and laid them on his stump for him. Nothing happened.

Next I turned to the birds, and bought a pair of field glasses. The price of Nature study had now risen to more than sixty dollars. Lying on my back in the grass, I would locate a flow of song and fix my binoculars upon it. No bird. I would fix on another spot. Much song, but no bird. I finally discovered that when you try to look at a bird he or she simply moves around to the other side of the branch, parallel to it and so that not a feather shows. If you go around to that side, the bird moves around to the first side, keeping step with you. If you go under the branch, it moves on top. After a half hour of this, when the bird has given you a good case of the blind staggers, it simply flies away.

Then I turned to insects, and tried the butterfly net, leaping and prancing hither and yon across the flowering meads. It was a pretty sport if you did not mind wet feet and burs in your nylons, but the butterflies, showing extraordinary intelligence, did not fly into the net but out of it. If I swooped under them they flew up; if I swooped over them they flew down and the net collapsed; if I waved it in a figure eight through the air, the butterflies made a figure eight in the opposite direction.

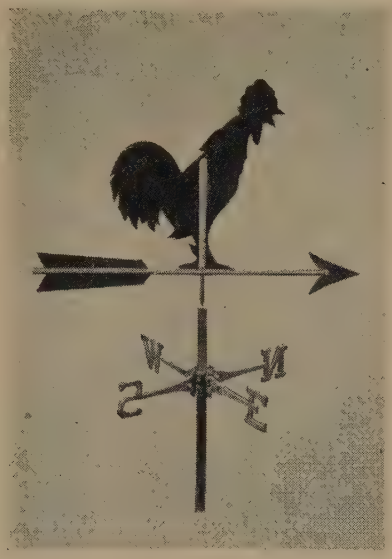
I tried grasshoppers, trying to sneak up on them. They would arrange themselves parallel to a grass stem, only their elbows showing, lean their heads over, peer at me solemnly with their long, horse faces and remain motionless. If, enraged, I made a lunge at them, they leaped out and up like firecrackers and simply dematerialized into thin air.

Then there was the mystery of the spiders. I did manage to catch them spinning their webs at dawn (and how I do hate to get up at dawn), but what worried me was that, although the webs were soon full of captive flies, the spiders never ate. Day and night they squatted in the center of their webs, with me ditto in a bed of damp (Continued on page 552)



PHOTOGRAPHS FROM HAMMACHER SCHLEMMER

# For the Gardener's Christmas Stocking



**There is a wide range and variety in the gifts that will be appreciated by the gardener. A leaf or refuse burner is always a handy thing to have, what with many local restrictions on leaf fires. Or, perhaps, a Tote-Lite would please the gardener who may have to pick his tomatoes after dark, or do other things in the garden after a hard day at the office. A set of garden and hedge shears is always welcome, and the neighbors will like to borrow them. Weather vanes are not precisely a garden implement but they dress up the home environs, and are to be found in many interesting designs.**

By ANDREW S. WING

WHAT TO give for Christmas is a perennially interesting question—indeed, in these times, baffling might be a better adjective. Fortunately in the garden world, however, there is a good supply of useful gadgets, as well as luxuries that the thrifty gardener would like to have but might hesitate to buy for himself. The Editor has thoughtfully given me carte blanche to list a few things I would like to own. So, after browsing through catalogs, and visiting some of New York City's better horticultural establishments, here are some suggestions to Santa Claus. And if any of my friends or members of my family read these lines, so much the better.

First on the list might come seeds. A gift made up of a good collection of vegetable seeds from a reliable house, with a few flower novelties included, should be appreciated. To this the gardener can add some others he specially likes, or wishes to try, and thus have a good start on his 1947 garden. Any varieties he does not particularly wish can be handed to friends.

Bulbs would, perhaps, come next on the list—lilies, or gladiolas, or dahlias. If you have a friend who fancies roses, irises, peonies or other hardy plants, a gift order for later delivery would fit nicely into the Christmas stocking. Indeed, a gift certificate allowing the recipient to select at will at seed and garden supply stores is always a happy holiday choice. If you want to give a present of named varieties of plants, a little detective work to discover your friend's special enthusiasms would be in order.

Among flower seeds there are always novelties in petunias, marigolds, zinnias and other favorites. Should your gardening friend be a special lover of zinnias, for example, a collection of seeds of the newer and better varieties should make him happy. It may be a bit dangerous suggesting a choice of seeds or plants for someone else, but some of the finest things I have ever grown have been gifts from generous friends or horticultural firms, so really it is not too risky.

When it comes to tools and garden supplies the sky—and your pocketbook—are the limit. Although I happen to be equipped with all the tools the average gardener should have, there are some items that would help me do a better job, or, at least, improve my morale. I could use a rubber-tired wheelbarrow,

**A Christmas gift of a selection of seeds is not as risky as one might think. W. Atlee Burpee Company experimented with a gift seed collection last year, and was surprised at its reception and the number of letters of appreciation received from those who had been given one.**

and a wire leaf rack, as well as a steel broom rake and a wooden lawn rake. I have long wanted a real scuffle hoe, and have seen an imported English one for two dollars—the kind you push through the ground. A machete or brush knife is valuable when working in brush or tall weeds, and for some kinds of pruning. I could use one, such as one that comes complete with a metal sheath at $4.50. I treasure a long-handled cultivator hoe—the kind with five prongs—and know that it would be a welcome sort of present to anyone.

Speaking of cultivators, any gardener would delight in a wheel hoe. Mine is the high-wheel kind, old and wobbly, with the bolt that holds the plow point rusted fast. I can still get by with it, but I could do an even better job with one of the improved, low-wheel models and its full set of gadgets. Any gardener who has never gardened with a wheel hoe has missed something and would truly appreciate one as a gift.

Before we leave the subject of cultivation we must toss out a suggestion about one of the modern garden tractors. My own budget will not include one until we get a larger place, but should one of my more affluent friends wish to give me one it would be put to good use in my two vegetable gardens. It would enable me to do my own plowing, spring or fall, and would save countless hours in cultivating, as well as in lawn mowing, if there were a mowing attachment. It would not take long to make a midget tractor pay for itself when one considers the high cost of garden help.

Turning to insecticides, I could use a new pressure sprayer, also a new, large-size duster that would do a better job than the one I now have. Should anyone choose to include a supply of rotenone, DDT, 2,4-D, or other plant chemicals, I would not mind a bit. It might not be as glamorous as a new dressing gown, but the dressing down made possible by a ton—or even a couple of yards—of well-rotted manure, left at my back door Christmas Eve, would have its certain allure. I am sure many a gardener would agree.

A clever new device for eliminating weeds and other pests is the flame-thrower. It can be used to kill weeds, thaw ice, crack rocks, disinfect the poultry house, sterilize the soil, manicure the tennis court, or burn poison ivy from the stone wall. It is lethal to tent caterpillar and ant nests, and seems to have unlimited possibilities. Should anyone love me enough to spend $23.50 on me, this means of carrying modern warfare to the garden front provides the opportunity.

To return to the more artistic side of gardening, certainly there are few places that could not benefit by a sundial, a bird bath, a garden seat of cement, stone or iron, a weathervane or bird houses. And the wise gardener is something of a weather student, so a good thermometer and a good barometer would be welcomed. There are some handsome and amusing weathervanes at reasonable prices, and they add that certain touch.

Again on the practical side, a new piece of hose, either rubber or plastic, is often welcomed to replace the one worn out during war years. And there is a thought in a good lawn sprinkler, such as the kind that ambles around the yard by itself. A hedge trimmer, either mechanical or electric, would be widely

**A moderately-priced yet efficient kit for testing one's garden soil is a welcome gift. Such a kit is represented by this Junior Professional set manufactured by the Sudbury Soil Testing Laboratory.**

welcome, particularly where the boss-man wears his arms out with an old-fashioned pair of hedge shears. New trimmers also save much time.

No home garden is complete without birds, and if you want the birds in winter you must offer them more inducement than merely sheltering trees and shrubs. The birds will patronize those who feed them best, and that means bird feeders, as well as bird houses. One of my favorite catalogs lists a number of new and interesting feeders, automatic and otherwise. And a good supply of seed cakes, peanut butter balls, seed and such are needed to go with the feeders, so there is no more appreciated gift to the bird-loving gardener.

While outdoor cookery may not be precisely gardening, it is akin to it, and the equipment that goes with it is often a part of the garden scheme. A portable grill is a fine gift for a family that has an outdoor fireplace, or a good spot in which to build one. There are many such grills on the market, the prices varying with the fanciness of the ironwork and the frills. There are also a lot of gadgets useful to the outdoor chef, from asbestos gloves to special sets of tongs. The whole outdoors is the limit so far as gifts of this sort go, and this field contains many suggestions for a friend or for a family that likes cooking with the smell of wood smoke.

There are plenty of opportunities to please friends who love plants indoors. A beautiful bowl of bulbs is always a nice gift, and the blooms can be started in advance of Christmas. Every family with sunny windows can use flowering house plants, such as geraniums, begonias, African violets and others. Even without much sun, plants such as ferns, philodendron or ivy make attractive presents. A glassed-in garden is a practical gift, as is a terrarium filled with cactuses and other drought- and heat-resistant plants. Such a gift is particularly appropriate for an elderly person, or invalid or shut-in, and no house or apartment is really complete without a few green and growing things.

There is hardly any need to mention the multitude of artistic and beautiful pots, vases, jars and other flower containers on the market, just demanding to be selected for presents. My wife always complains that we do not have enough vases in the house, and this is a frequent plaint.

For the scientific gardener a soil-testing kit is a welcome gift, and there are good ones available at moderate prices. Such a kit gives the gardener something to do when work outside is prevented by the weather.

Books, of course, make ideal holiday gifts, and there are many books that will delight the gardener. There are too many to name here, but a list of garden books will be mailed to any reader who will send a stamped, self-addressed envelope.

To end this Christmas shopping list on a modern and up-to-the-minute note, one final—and expensive—suggestion is a home freezer, that new adjunct to the garden. For the owner of one, or the hopeful individual who looks forward to one, the book *Into the Freezer and Out* is an excellent treatise on this new home item. It is published at $2.50 by the Avi Publishing Company, New York 3, New York. Perhaps Santa Claus will not bring a home freezer, but he can certainly transport to the garden-loving folk some of the appropriate gifts that have been suggested here—proposed in the hope that they may be helpful hints.

★

# Sleet Storm

*By* E. F. HEYDINGER

The sleet drives through the leafless trees,
It piles against my window pane,
The creaking limbs portend a night
Spun in some sad satanic brain.

My cottage room is snug and warm,
The fire flickers on the wall,
Dead ashes fall beneath the grate—
I listen, wake and ponder all.

Through ages of forgotten time
The rains have come in varied form
To sink into the mold and feed
The forest for the yet unborn.

I'm thankful for the storm tonight,
For driving sleet o'er wood and lea,
For burning logs that keep me warm
And fitted boards that shelter me.

**To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.**

# The Colors of the Stars

*By* ISABEL M. LEWIS

THERE are many casual observers of the heavens who maintain that, as far as color goes, all stars look alike to them. Possibly some of them are color-blind, but, on the whole, it is true that color differences among the stars are not as strikingly apparent, on a first glance at the night sky, as they might be. More than five-eighths of all stars are about equally divided among the stars classed as white, deep yellow, or orange. The intensely hot bluish-white stars, and the red stars, are comparatively few in number, although the former are found among the brightest stars out of all proportion to their total number. They are confined almost entirely to the Milky Way.

It is a well-known fact that the color of a star depends upon its temperature and its type of spectrum. The various types of stellar spectra have been elaborately classified. The Harvard College Observatory classifications of star spectra are among the most widely known and adopted, although at many observatories astronomers are engaged in the study and classification of the spectra of the stars. A recent interesting "Contribution from the Mt. Wilson Observatory," by Joel Stebbins and A. E. Whitford, has to do with the colors of 238 stars of different spectral types.

There are seven principal divisions of the stars into types depending on temperature, spectrum, and color. These range from the excessively-hot stars, whose temperatures may be 26,000 degrees Absolute, or more, to the coolest of all stars, with temperatures 3000 degrees or less. They are designated in order of decreasing temperature O B A F G K and M. There are, moreover, subdivisions of these types from zero to nine, so that there is a gradual change from one type of star to the next. Type-O stars are rare. The hottest of all stars, they fall into two groups, one showing

bright bands due to hydrogen and helium chiefly, and also called Wolf-Rayet stars, and the other with absorption lines of the same elements. The atoms in the atmospheres of the O-type stars are ionized to a high degree, as are also the B-type stars that follow them, although to a less degree. B stars, also called Orion stars because they are found in such large numbers in this constellation, are bluish-white like the O-type stars, and they are also called helium stars because their spectra show the characteristic absorption lines of helium. Lines of hydrogen also appear in their spectra. These are the bluest of all stars, even more so than the O stars, which, for some reason not clear, are slightly tinged with yellow. The three stars in the Belt of Orion are B-type stars, while the star of third magnitude in Orion directly below the great nebula, and known as Iota Orionis, is one of the rare O-type stars. Spica in Virgo is one of the bluest of the stars, and of type B. The temperatures of these B stars, although less than that of the O stars, average more than 20,000 degrees, and the degree of excitation of the atoms in their atmospheres which determines the temperature is slightly less than that of the O-stars. High as these temperatures are they are but surface temperatures. The temperature at the center of an average star has been estimated to be around 40,000,000 degrees. Other well-known blue-white stars of B-type are Bellatrix and Saiph, diagonally opposite each other in the constellation of Orion, and Zeta Tauri, the more southerly of the two stars that mark the tips of the horn of Taurus. Three of the stars in the Southern Cross, Acrux at the top of the Cross, and Beta and Delta, which mark the ends of the cross-arm, are all bluish-white, B-type, or helium stars. In later types of stars helium lines disappear.

The A-type stars are the white stars, often called the hydrogen stars because the lines of this element predominate in their spectra. Their surface temperatures are about 12,000 degrees Absolute. Sirius and Vega are the most prominent members of this type, although to many observers both of these stars appear to be bluish-white rather than white. This may be because of their great brilliance and the scintillation of their light.

In type F the lines of calcium become more prominent than those of hydrogen, the surface temperatures average between 7500 and 6500 degrees Absolute, and the stars are pale yellow in color. Two well-known stars of this type are Canopus and Procyon.

The G-type stars are also called the solar stars because our own sun is a star of this type. These are the yellow stars whose temperatures are around 5500-6000 degrees Absolute. In their spectra the lines of calcium are still prominent, and many other metallic lines appear, while the hydrogen lines are no longer prominent. Among the stars of this type will be found Capella and Alpa Centauri, our nearest neighbor among the first magnitude stars.

Stars of type-K are orange in color, and in temperature approximately 4000-5000 degrees Absolute. Calcium lines are still conspicuous, and there are many metallic lines, but the intensity of the spectrum decreases toward the violet end of the spectrum. Arcturus is the best-known star of this type, although Alpha Ursae Majoris, the more northerly of The Pointers in the Big Dipper, and Pollux in Gemini, are orange-colored K-type stars.

The M-type stars have dark absorption bands in their spectra and the violet end of the spectrum is very weak. Calcium lines remain prominent even in these stars, which, with surface temperatures 3500-3000 or even less, are the coolest and reddest of stars. Betelgeuse, Antares and Gamma Crucis, at the foot of the Southern Cross, are all red M-type stars. Aldebaran is about on the border-line between a K-type and M-type star, although it appears quite red. Rigel, which has been described both as a bluish-white star and a white star, is on the border line of the B-type and A-type stars. It also has the letter "p" attached to its B8 type, and this stands for peculiarity of spectrum. In this star there are intense radiations of ultra-violet light.

It will be interesting to know, in a general way, how stars are classified as to color and spectrum in order to seek out a few well-known bright stars in December skies, and to see how well the colors to be expected from their spectral type agree with those actually observed.

All stars in the Big Dipper should appear white, with the exception of the star at the end of the handle, which should, according to its type, be bluish-white, and the star of The Pointers, which is farther north and which should be orange in color. Polaris should be yellowish in color. Castor and Pollux in Gemini are not twins in color, according to their spectral types. Castor should be white and Pollux a deep yellow. Capella in Auriga is a solar type star, so should be yellow, as our (Continued on page 550)

# Symphony in Gray

*By* MAY ALLREAD BAKER

The sky is a gray, and silver-gray the dawn
Where pearly shadows glide. The graybeard sea
Shines with a steely luster; every tree
Is hoar and leafless with its beauty gone.
The flowers are grizzled now, upon my lawn,
And taupe the branches of the lilac bush;
The frosted mullein leaves are soft, dove plush
Against the tangled, withered hedge forlorn.
Now, dark as slate, the still pond waters lie;
And drab the fields that grew the amber grain.
Gray shapes in this dim light, cows pass me by
To cornstalk pastures in the narrow lane.
While, with the coming day, the clouded sky
Dissolves in tears of cold December rain.

# The School Page

Edited by E. LAURENCE PALMER

Professor of Rural Education, Cornell University, and Director of Nature Education, The American Nature Association

## POINTS ON CACTUSES

A TEACHER without imagination should resign immediately. One *with* imagination will recognize in cactuses a wonderful opportunity to broaden the experience of pupils, incite a desire for new and worthwhile experiences, improve an understanding of some reasonably common situations, correct some generally accepted misunderstandings, suggest some possibilities for commercial developments, and enrich one's intellectual understanding of some misunderstood parts of the world and of organisms found there. Any teacher with imagination may read the above sentence and apply it to the opportunities that present themselves for the study of cactuses, and read no further on this page. The meat of this story is found in the special insert in this issue of *Nature Magazine*, or, more realistically, in cactuses themselves.

There was a time, before the days of Mr. Woolworth and his imitators, when an article such as this would have been ridiculous. Today, any teacher able to visit a 5-and-10 can find materials for study for a most reasonable investment. I get no royalty from such stores, but if you were to choose between just reading what is here written, or getting as rich a collection of cactuses as possible from the stores, without reading anything more, I would prefer that you get the cactuses. If you get the plants you will eventually want to know more about them, and then what I write here, and what others write elsewhere, may be of greater import. I absolutely guarantee that sitting in an armchair reading about cactuses will be infinitely less stimulating than sitting on a cactus reading about an armchair. I hope you resort to neither extreme, and base this on bitter experience from sitting on cactuses in Florida, Colorado and California.

If the first thing, then, is to get a collection of cactuses, then the next thing is to see that you keep them healthy and happy as long as possible. Their care is quite different from that ordinarily accorded plants, and some new wrinkles will have to be learned, either by reading or by bitter experience. We know of nothing better than the references suggested in the special insert. Any schoolroom can well spare one windowsill on which to grow a cactus garden of a generous variety of the plants. This afternoon I made a visit to a local dime store and there found half of the cactuses described in this insert. True, there were a few that are not described in the insert, but I doubt if there were any not described in even the cheaper supplementary references suggested.

One of the preliminary experiences with your new collection of cactuses might include attempting to discover the appropriateness of the usual common names applied to them. Rat-tail, old man's beard, barrel, organ-pipe and so on should be enough to give you a start. It is doubtful if you could ask children to suggest their own names for these plants without their picking a reasonable number of the names in common use. Older children may in a few cases be interested in trying to recognize the significance of some of the scientific names, and may realize that, while some are in part descriptive, others are given for entirely different—and sometimes hard to understand—reasons.

As is the case with most plant groups there are superstitions associated with cactuses, or misinformation about them, that should be avoided if we are to rationalize our relationships with them. Their role as sources of drinking water for lost explorers has been so thoroughly dramatized by the movie producer, and the pulp magazine short-story writers, that it is hard to convince many of the facts in the case. In the insert we have tried to correct some of these false conceptions.

But if it is difficult to correct some false ideas we have about cactuses, it is also difficult to understand some of the facts. How cattle can feed on some of these plants and survive; how some birds can nest safely amid a forest of spines so brittle that they seem to break if you merely look at them; how kangaroo rats and other mammals, with hides and hair not too dissimilar from ours, can dash about bare-footed at night through cactus mazes, and not look like a dog that had a fight with a porcupine, is hard to understand. We almost come to the conclusion that the cactuses must have minds of their own, and the ability to inflict injury on organisms they consider their enemies, while offering welcome sanctuary to others who, for some inconceivable reason, seem to be immune from their weapons. I have seen a roadrunner dash, apparently blindly and in perfect safety, through a jungle of cactus growth that made me shudder if I merely looked at it.

If we will examine the spines of the cactuses available for study we will be intrigued by the patterns of spinal arrangement to be found in the different species, and in the different parts of some species. Unless we are willing to do this, little progress can be made in learning to recognize the different species.

Cactuses offer a good vehicle for the study of conservation. We might think that they would need no protection, other than that they already have, but an auto trip through good cactus country amply proves the contrary. Tourists are as avid in jumping from their cars to get a new cactus for their collection as are travelers in the cooler, moister regions to despoil spectacular stands of flowering dogwood, trailing arbutus and young Christmas trees. It is refreshing to note that, as a rule, the communities where cactuses grow in abundance have usually recognized the appeal of these plants and have provided legal and moral means for preserving the natural flora of the region.

Of course the most spectacular thing about cactuses is the way in which most of them bloom. One day they appear at a distance to be drab uninteresting things; a few days or a week later they are ablaze with color. Even more intriguing are the spectacular blooms of those that seek pollinating agents by night. The first night I saw a display of a hedge of night-blooming cereus in far-off Hawaii I was so thrilled I could hardly sleep, in spite of the fact that I faced a hard day of teaching. To this day I could take you to the exact spot where I stood and gazed, mouth open, at that hedge. Things that leave impressions like that have value, and must be mentioned in notes bringing out the good points of cactuses.

I rather doubt if there is an elementary school in the country in which at some time the children do not study Mexico and our other immediate Spanish neighbors. We have our children copy pictures of cactus-studded scenery. How much

## To a Fruit-Eating Bird

*By* ROBERT SPARKS WALKER

You have as just a right to scold
A man when he is acting bold
In picking cherries, or the fruits
Of other trees, as he who shoots
At you when you alight to claim
Your share of crops; for in your name
Is title to both fruit and tree,—
A perfect deed,—the property
Is yours in common with all men,
Because you are a citizen,
By Nature's laws entitled to
All fruit you need for work you do.

more satisfactory would be the experience if the children could make their drawings from actual plants. How much more significant would be our geography if a trip through the dime store would suggest that this little cactus came from South America, this one from Central America and this one from North America. The insert should help you answer some of these questions about cactuses that I hope will soon find their places in your school room, if they are not already there. And do not forget to look up the organization of cactus fans and their publications, about which we gave a willing notice in the insert.

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## A PARABLE

*By* EVA GRAVES PRICE

As a garden grows older, its owner soon finds the need of space for a brush pile. Plants and trees need pruning, and diseased and dead parts must be burned. What a blessing is fire to clean what is foul. A vast deal depends on the sanitation of our lovely gardens. The good gardener spies out the dangerous enemies, and sees that they are consumed by fire in the brush pile.

But by no means should all refuse be destroyed. Years ago, I was walking in the glorious garden of a friend. I turned to its creator and asked, "How do you do it? I could never make things grow like that." Then he led me to a corner, sheltered by a vine-covered lattice, and showed me a great pile of what looked like just dirt. Here is the secret, he said, a compost heap. Into this pile go the faded flowers, leaves, grass clippings, everything that has lived its life and withered. Here this humus decomposes, is mixed with mother earth and manure, and, in due time, goes to nourish the garden. But it takes time, and some care, before it is ready to serve again in the cycle of growth and decay.

As time went by, and I slowly developed a garden of my own, I pondered the brush pile and compost heap in relation to our lives. This was made vivid for me by a dear old man who came frequently to our house to visit. He was always bewailing the fact that thoughts of the unhappy and disagreeable events in his life went round and round in his mind, making his many wakeful hours wretched. Then I saw that we all need a brush pile in our lives where we can burn the larvae and worms of small hates and jealousies, the menacing scales and borers of suspicion, antipathies and misunderstandings. It takes vigilance to watch these bad little bugs, and a high resolve to say to these evil tendencies: "Get thee behind me to the brush pile. I will have only the beautiful growth of friendliness and love in my garden."

We must know what properly goes on the brush pile, and what into the precious compost heap. The inevitable disappointments, brave attempts that failed, the fragrant friendships, so flowery and sweet, that had to end, illness so thorny to bear, but full of valid experiences; all of these go into the compost heap of our living, sometimes consciously, more often, unconsciously. Then, if there is a good gardener who senses the deeper meanings, and has the courage and patience to accept and interpret them, they come out in time, a long time, the richest, sweetest compost that makes our spirits grow like flowers, full of vigor, color and fragrance.

So, wise is the man who gardens both his acre and his life, with a brush pile kept burning by the refining fire of love, and a compost heap well mixed with a calm philosophy. Then, in a long maturity, he can revel in a deep happiness.

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## More on D.D.T.

Of particular interest to those who have been working with the insecticide known, for sake of brevity, as D.D.T. is a pamphlet entitled "Some Properties and Applications of D.D.T." This reports on experiments conducted by British scientists, and it corroborates or supplements studies made in the United States. A copy of this report is available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y.

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## Record of Civic Advance

*American Planning and Civic Annual.* Edited by Harlean James. Washington, D. C. 1946. American Planning and Civic Association. 226 pages. $3.00.

Since 1929 this annual has been issued as a means of assembling between covers a record of civic advance in the fields of planning, parks, housing, neighborhood improvement and conservation of natural resources. It is a compilation of outstanding articles, or the reprints of addresses falling within the proper scope of this volume. It is always a valuable source of both information and inspiration to those working in these constructive fields.

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## A Wren Friend

Living in Academy, California, in the lower Sierra foothills, Mrs. M. Vance has found many fascinating wild friends. Most individual among them, she reports, is what she describes as a Parkman wren. This bird took to following her around, lighting on fence or tree near her to sing whenever she stood still. His song, which seemed much too large for his small body, was always merry. This year the bird returned, more friendly than ever, entering the house nearly every morning through a small hole near the roof, and singing Mrs. Vance awake from atop the door to her room. Once he had gotten her up, he would go out to continue his song from the oak beside the house, as though wishing to be sure of an audience.


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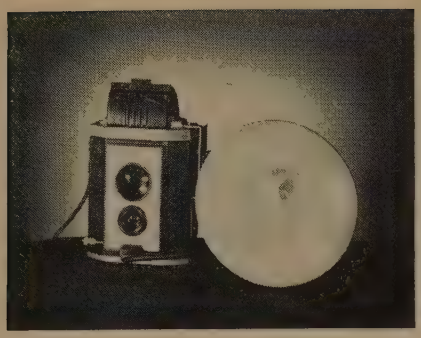
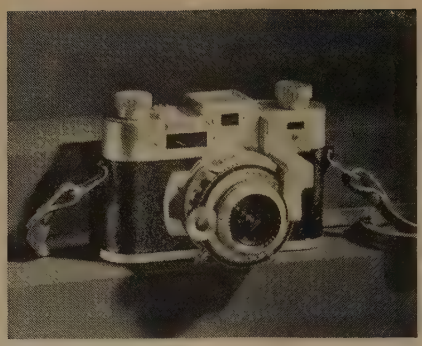
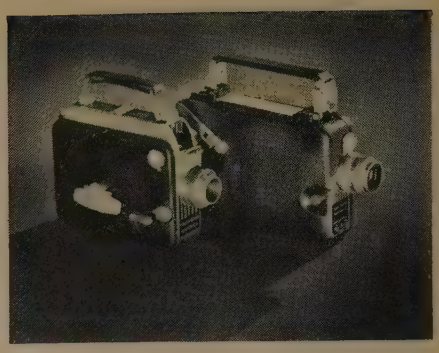






**Three Eastman products that would grace any camera fan's Christmas tree—the Brownie reflex synchro model, the Kodak 35, and, in a higher bracket, the Ciné-Kodak Magazine 8 and 16 movie cameras.**

# Camera Trails

*By* EDNA and BILL EVANS

It is more blessed to give than to receive—or so the old saying goes. There is a lot of truth in it, too. But along about the first of December, when one begins making up a Christmas list of what to get for whom, that giving business can cause a lot of wear and tear on both the pocketbook and the brain.

It is lots easier, though, to buy for someone who has a hobby—that is, if you are the kind of giver who prefers to avoid the easy things like loud neckties, monogrammed handkerchiefs or writing paper. If you have a hobbyist on your list—a camera fan—you will get a big kick out of shopping for him, especially if you happen to be something of a film fiend yourself.

In preparation for this Christmas shopping number of "Camera Trails," we began in September to query a number of camera supply houses, asking for advance information on items they expected to have ready for the holiday trade. The replies we received have enabled us to prepare quite a letter to Santa Claus on our own behalf. There are items to fit every pocketbook and every stage of camera craft, from youthful beginners to those far along in the art of picture taking and print making.

The ideal Christmas gift, according to our way of thinking, should meet two specifications. First, it should be usable. Second, it should be something the receiver might not get under ordinary circumstances. Camera equipment can fulfill both these requirements, for there is no end to the number of gadgets the shutterbug can use. Some he can get along without and others he cannot afford—and that is where the second requirement comes in.

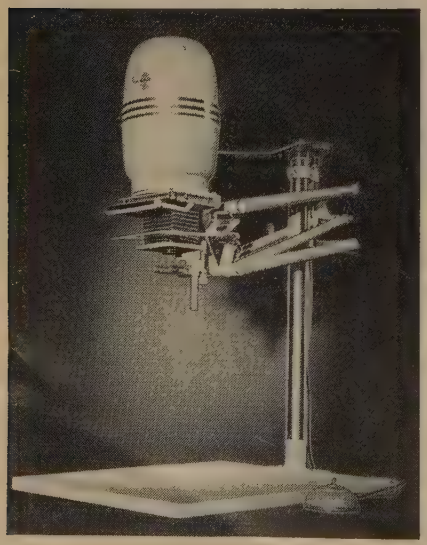
The gifts do not need to be expensive. A couple of rolls of color film in the toe of a stocking on Christmas morning can bring plenty of joy; so can a book on photography, a filter or an exposure chart. Farther along in the price range, a shiny new enlarger will look mighty nice under a Christmas tree. More expensive still, a portable photo-bar, or a prefabricated darkroom, can really make Santa's call a long remembered one.

Starting first with cameras, Weimet Photo Products Company has announced a new Rocket candid-type camera that retails at $5.50. The price includes carrying case and a roll of Weimet panchromatic film, with sixteen exposures per roll. The Rocket has a 50mm lens, a rotary shutter that facilitates quick snap-shooting, and an optical eye-level viewfinder. Its bakelite case is shaped to fit the hand, and its sturdy build should enable it to stand considerable rough usage.

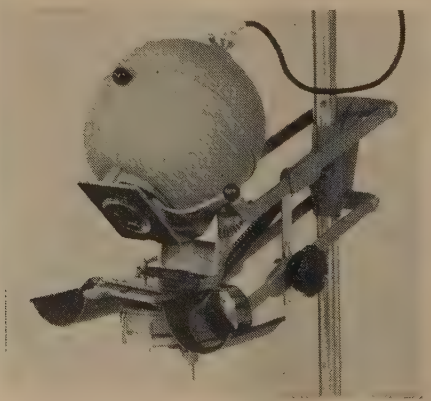
The Eastman Kodak Company reports six cameras as being "now in production and should be reasonably available for Christmas sale." The Kodak 35 is a miniature-type camera with an f/3.5 lens, range finder and built-in flash synchronizer. The Kodak Medalist II, with its flash supermatic shutter and coated f/3.5 lens, offers even greater ease of operation and versatility in the miniature field.

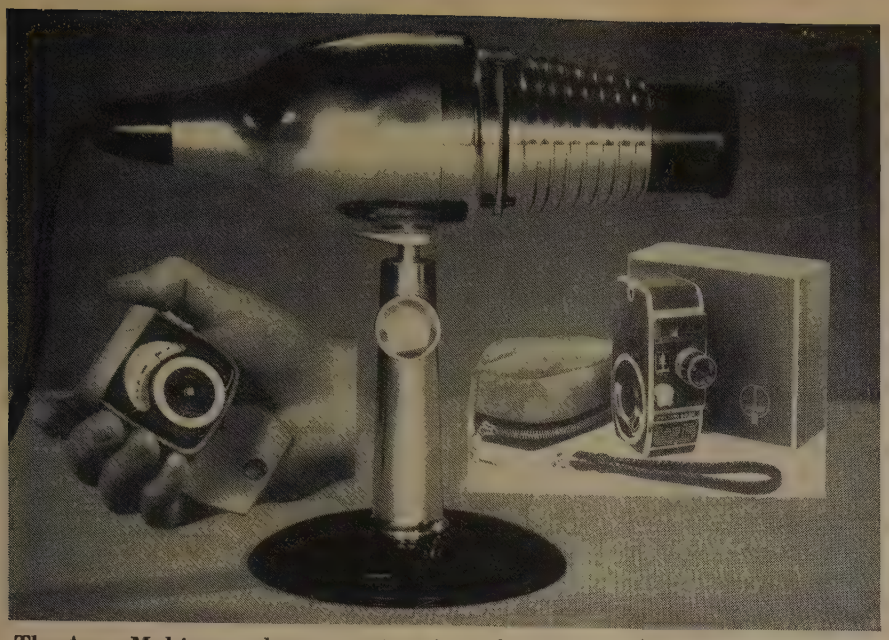
Eastman's Brownie Reflex synchro model is a handy sized little camera that enables the user to see what he is "shooting" when he takes his picture. This Brownie also has a synchronized flash attachment. The fourth Eastman camera is the Kodak Vigilant, which has a Kodak bimat lens and a flash dakon shutter. This camera uses 620 size film and gives 2¼ x 3¼ inch pictures.

In the movie field, Eastman offers two cameras, the Ciné-Kodak Magazine 8 and the Ciné-Kodak Magazine 16. The former uses 8mm. film, features three-second slip-in loading with



**At the left, the new Solar Autofocus enlarger from Burke and James, then the head of E. Leitz's Focomat 1b enlarger, and the de luxe Photo-bar.**





**The Apex Multiscope that serves a variety of purposes for the camera hobbyist. Inserted at the left is the postwar model of the Electrophot, a clever exposure meter; insert, right, the Bolex L-8, movie camera.**

interchangeable film magazines, four operating speeds including slow motion, and an enclosed direct-view finder. The latter uses 16mm. film, a slip-in loading device with interchangeable film magazines, eye-level finder and three operating speeds including slow motion. Both are equipped with f/1.9 lenses and six accessory lenses.

Another movie camera lately on the market is the little Bolex L-8, offered by the American Bolex Company. Like all movie equipment, the Bolex price runs into three figures, being quoted at $148.43, complete. Main feature of this 8mm. movie camera is its constant speed motor, which prevents undue lag or speed-up, and makes for better exposures.

Coming down out of the clouds of amateur moviedom and returning to gifts suitable for a "still" cameraman, we recommend an exposure meter for those who do not already own one. There are a number of these on the market at varying prices. Among the newcomers is a postwar model of the Electrophot, the 14-A, recently announced by Adair and Rhamstine, Detroit. The new model follows earlier ones made by the same company, and incorporates features made possible by wartime research. The calculator dial is arranged for use with both still and movie cameras. Also, the literature says, "the dial is so simple that the average time from reading to exposure determination is less than fifteen seconds." If this is so, we are heartily in favor of it. Our main objection to exposure meters is the lengthy and complicated figuring necessary before the reading can be interpreted and acted upon. The 14-A is listed at $13.00, with an additional $1.50 for a leather case.

Actual picture-taking equipment is not the only type of gift welcomed by the camera fan. Darkroom supplies, too, offer almost endless gift possibilities. An extra tray is always welcome, or a funnel, or a can of developer, or a package of enlarging paper. Then there are print timers, a new type of film developing tank, a graduate, or any of a dozen and one pieces of equipment.

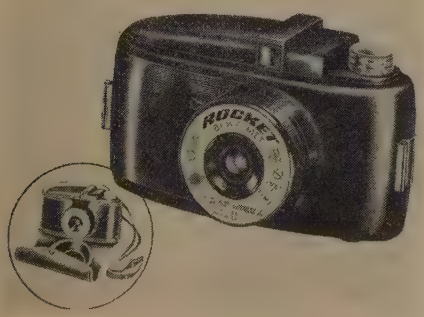
Center or heart of any darkroom is the enlarger. This, of course, represents a considerable outlay of money, but no darkroom can function efficiently without one. There are many styles and makes of enlargers, just as there are of cameras. The type selected depends largely on the type of work to be done. But, since one scarcely would be apt to buy an enlarger for a casual acquaintance, that question could be pretty well solved before the actual shopping starts.

In the miniature field, E. Leitz now has the Focomat 1b enlarger in production. The Focomat is specially designed for Leica users, and will enlarge up to thirteen times the size of the original negative. Focusing is completely automatic—all that is necessary is to raise or lower the enlarger head to obtain the desired print size.

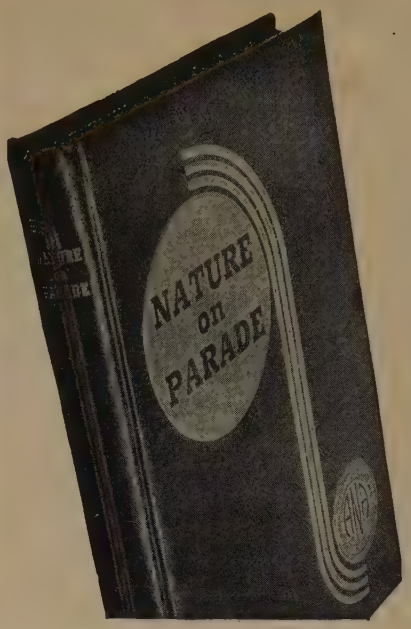
Another new enlarger on the market is the Solar Autofocus model made by

(Continued on page 552)

**The new Rocket, an inexpensive and tough little candid-type camera.**





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## THE COMING ERA OF SUN-POWER

(Continued from page 516)

with success—as one of them seems on the verge of being—we can expect widespread, although unpredictable, political and economic readjustments, possibly of a revolutionary character. Present tensions over world power-supplies may suddenly relax, one hopes, but new rivalries will probably arise at new and unexpected points. These developments may even have important effects on the visibly approaching Age of the Atom, so violently foreshadowed over Japan and at Bikini.

We are waiting, almost holding our breath, for the outcome of the atomic drama. We do not know whether our cars will run by transmutation, or whether we will all be atomized into oblivion. It may be that man-made atomic power will prove far too expensive in comparison with the trillions of horsepower flung earthward by the sun. Economic forces could conceivably send our fabricated atomic power back to the cyclotron, while we build an ever more brilliant material civilization with ready-made atomic energy trapped from the blue.

Such an outcome would be far less dangerous than the one apparently being planned, albeit inadvertently, by a bungling world.

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## DEER RENDEZVOUS

(Continued from page 521)

We turned, expecting to see the men. But there, not twenty feet away, instead of human beings, stood a huge young buck, head lifted and feet braced in defiance. Two does, who had fled at his signal, were bounding up the hillside. Our hearts were in our throats, but not from fear. Lone women that we were, with no means of defense, we were too inexperienced to know that there was danger of attack if we should make the slightest show of resistance. Our sole emotion was petrifying excitement at being thus challenged by a "monarch of the glen," after three weeks of vain hope of a glimpse of one somewhere in the forest.

How long that enraged buck held his stance, we shall never know, but long enough for his harem to be well out of danger. Then, with another and louder "Psst," he too fled in enormous leaps, all four feet drawn together like a bucking bronco's, short broad tail erect, exposing its "white flag" underside. At this second signal, every animal in the field, fourteen in all, disappeared as if by magic into the nearest woods.

When we were somewhat calm once more, our unwoodsmanlike eyes discovered deer prints crossing the log on which we sat, and forming a well-worn path to the meadow. Apparently this was the private route of the young buck and his does, a route upon which no one, perhaps, man or deer, had ever before presumed to infringe. Our accidental choice of that log had given us the chief thrill of the evening.

The following day we recounted our experience to the owner of the meadow, with the remark that he surely could feel justified in enjoying his winter venison after feeding the herd all summer. The tall angular mountaineer shook his head. "No, I don't see it that-a-way. I figure a deer has a right to a livin' same as me. I've never shot one the twenty-five years I've been here. Just couldn't, you know. Them soft eyes would haunt me to the end of my days."

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## A GUY NAMED BILL

(Continued from page 522)

He detested umbrellas; they were the only objects about which he showed any timidity. A few of the caddies used to tease him, but he had his own method of retaliation. He would fly to the top of a tormentor's head and peck ferociously, driving the offender into retreat. These onslaughts hurt.

Bill never mated. If he ever felt the call of the wild it was left unanswered. In the winter he spent more time indoors, not because of the weather but because he seemed to crave company. His outdoor roaming was confined to the vicinity of the clubhouse, and a succession of staccato raps on either side of the window were a sign of desire to come in or go out. He was an inveterate hoarder, and long after his departure evidence was found of his camouflaging ability and ingenuity. He probably could not remember all of his caches, but he certainly knew the recent ones, as anyone venturing near soon discovered.

Bill died on Christmas Eve. The cause of his death was never actually determined, but it was certainly accidental. He was discovered on the golf shop doorstep. Tragedy hung over the Club that night, for Bill was widely loved. But he was not allowed to become just a vague memory. An expert taxidermist restored him to lifeless grandeur, and Bill now occupies a special niche in the Nineteenth Hole. One admirer had a bronze plaque made. On it is inscribed: "In memory of Bill. He was one of us."

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## THE COLORS OF THE STARS

(Continued from page 545)

own sun would appear if it were seen at a distance of several light years.

Fomalhaut has been a beautiful object in the southern sky during the fall and now nears the southwestern horizon. As a type-A star, it may be expected to be a brilliant white. The Pleiades are of late B-type on the border between the bluish-white and the white stars. In the Hyades Aldebaran should appear more red than orange, another star on the border between two types. Betelgeuse in Orion looks the part of the giant red star that it is. Here in the constellation of Orion there appear in large numbers, especially as seen through the telescope, the typical bluish-white helium stars. The three stars in The Belt are strikingly bluish. So are Bellatrix and Saiph; but Rigel appears more bluish than white. The Dog-Stars are noticeably different in color. Sirius is classified as a typical white star, and should appear so. Procyon should be, according to its type, a pale yellowish star. If viewed not too close to the horizon, where the effect of the atmosphere on the light of the stars produces a reddish tinge, the stars should appear very much as their spectral type indicates. After all, stars do differ quite noticeably in color one from another, even to the casual observer, and knowing the color of the star we know also something about its temperature and its spectrum. It is an interesting fact that there is a reddening of the light of many stars of different types due to the passage of their light through clouds of obstructing matter in interstellar space. In the spectra of some stars no such effect is apparent, while in others it is very noticeable. The presence of such matter in certain regions in space may even be revealed by the effect it produces on the light of the stars.

One should not look for color differences in even the brightest stars when the moon is up. Choose a clear dark night to compare stars of different color, and also stars that are well above the horizon.

Mercury will be well-placed for observation this month in the morning sky, a week or more before and after the date of its greatest western elongation on December 9. Venus is a brilliant morning star now. It will be at greatest brilliance on December 23, a resplendent object high in the southeastern sky before sunrise and easily found in broad daylight. Mars will be too close to the sun to be seen this month. Jupiter and Venus are only a few degrees apart in the morning sky and brilliant as Jupiter is, outshining all the stars except Sirius, it is noticeably inferior in brightness to nearby Venus. Saturn is in Cancer and rises after midnight. The sun will be farthest south of the equator at the winter solstice on December 22 at 5:54 A.M. Eastern Standard Time, when winter will begin in the northern hemisphere and summer in the southern hemisphere.

There will be a total eclipse of the moon on December 8, visible in the northwestern part of North America and the Arctic Ocean, and the western part of the Pacific Ocean, Australia, Asia, Europe and Africa.

# THE READER'S MARKET

**A place where members of the American Nature Association and readers of Nature Magazine may find many interesting offerings, or may advertise themselves, at low cost, for things wanted; things they have for Sale, for Trade, for Sale or Trade. This is an excellent forum for acquiring or disposing of such items as binoculars, books, cameras and photographic equipment, magazines, sports and outdoor equipment, etc.**

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1. *Transactions based on good faith:* Transactions are based on good faith and mutual satisfaction. Deliberate misrepresentation, disregard of usual business ethics or the attempt to circumvent these general requirements, when brought to our attention, will result in refusal of further advertising.

2. *All orders subject to these conditions:* We reserve the right to edit all copy to conform with our standards and to reject or discontinue any advertisement which we consider undesirable.

3. *Who may advertise:* This department is an open market trading post. Any individual or firm whose advertisement and methods of doing business meet our requirements may advertise their goods or services.

4. *Rates:* All classified advertisements must be accompanied by remittance. The rate is 15c per word including name and address—minimum charge $2.00. Cash with order.

5. *How to count numerals, etc.:* Groups of figures are counted as one word. Abbreviations consisting of initials or single characters likewise are counted as one word. Hyphenated words are counted as two words.

6. *"For Sale" ads must state prices:* A specific price must be stated on all FOR SALE ads —except that the phrase "write for catalog" may be used when listing real estate or merchandise in quantities.

7. *Conditions of trade or sale:* The condition of binoculars, cameras, instruments, other equipment useful to outdoor lovers, home-owners, etc., advertised for sale or trade must be specified as follows: PERFECT—meaning factory condition; EXCELLENT—meaning new condition, implying negligible amount of use; VERY GOOD—meaning practically new condition, implying little use, with no appreciable wear and only minor surface scratches or wear; GOOD—meaning moderate condition and with only moderate wear; FAIR—meaning no parts missing necessary to use; reasonable wear inside and out; POOR—meaning marred appearance or badly worn.

8. *Non-specific phrases barred:* Phrases such as "highest" or "top prices paid", as well as any other so-called "auction-type" phrases are not acceptable. The terms "fair price paid" or "state price wanted" may be used.

9. *Blind ads not acceptable:* Box number or blind ads will not be accepted. Give your complete name and address to insure prompt delivery of all mail or telegraph replies.

10. *Requesting privilege of examination:* Purchasers desirous of examining merchandise before acceptance should request shipment by express C. O. D. with examination privilege. This procedure permits the purchaser to inspect the merchandise in local express office and authorizes the express company to return unsatisfactory merchandise at shipper's expense.

11. The association will not accept for publication in NATURE MAGAZINE, advertisements of firearms, ammunition, or patent medicines.

12. *Responsibility for illegible copy:* Type or print advertisement plainly as we cannot be responsible for errors due to illegible writing.

13. *Closing date:* The closing date of all advertisements is the 20th of the second month preceding month of issue.

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### BOOKS

NEW MAGAZINE ADVANCE, 25c copy; year's subscription $3.00. Books. Magazines. Robert Martin, Nat. 57 Hart Street, New Britain, Conn.

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TRUE SECRET of Ventriloquism. First time published. Free Booklet. Quakerbush, Big Flats, New York.

## WHICH WAY TO NATURE?

(Continued from page 540)

dahlias, my aching arms holding the glasses to my dimming eyes. During the brief intervals when I had to go inside for nourishment, they may have eaten, but I never caught them at it.

I was by this time thoroughly frustrated. Evidently my technique was wrong. Instead of sleuthing around and prying into the home life of animals in the field, the thing to do, perhaps, was to collect them and observe them in captivity. That was how Fabre had worked, and look what he got.

So I now went about the world with nets, bottles and pasteboard boxes dangling from me. I bought a turtle in the market and brought it home. I rescued a large, black, slimy snail from some little boys, and deposited it in the fern box outside my window, nailing mosquito netting all over so it could not get out.

The turtle, green and brown, had thrashed his legs in the market with every sign of being delighted to be bought for a peso. But he took one look at me and retired into his shell. I never saw his face again. I made him a little box with low sides, lined it with fresh grass, put in drinking water and crisp lettuce leaves, and scrubbed off his back with a toothbrush. The next morning water and lettuce were untouched and he was gone.

I followed the slimy track of the snail across the window box to where it stopped abruptly at the woodwork wall. Plenty of slime but no snail. He must have melted himself and run through the crack. I now visited a toad I had captured the night before, and had shut securely in a shoe-box punctured with holes. I was fully expecting him not to be there. He was not.

I now gave up and sulked. The only conclusion was that animals simply did not like me. I went to the library and got out Maeterlinck on bees, and Fabre on the emperor moth, and stretched myself out on the lawn in a steamer chair. I found out more about insects in ten minutes than in three months of watching them. A friend joined me, and we began to chatter about this and that.

It was some moments before I became aware of a startling phenomenon going on around me. Down a tree-trunk not five feet away, the black lizard was descending, head first. On a branch above, a bird with a speckled breast had begun to sing, in plain sight. Off to the left my lost turtle was slowly crawling toward the swimming pool, and, believe it or not, a grasshopper from nowhere gave a terrific whirr and landed on my shoulder.

I had found out at last how to observe Nature. It dawned on me that animals have eyes as well as I, and that they do not like opera glasses, butterfly nets and shoe-boxes. What they like is for you to pay no attention to them and make plenty of noise.

The next time I plant seeds in the earth I am going to take along a volume of Edna Millay and read aloud to them.

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## CAMERA TRAILS

(Continued from page 549)

Burke and James, Inc., Chicago. This enlarger will accommodate negatives from 35mm. to 2¼ x 3¼ inches. Here, too, the focusing is automatic.

Print drying is always a tedious chore in the darkroom. Without the proper equipment, the photographer either frets and fumes while the prints dry naturally, or else he resorts to some kind of quick drying method (such as over the kitchen stove). Seven out of ten times this latter hurry-up technique ruins the prints.

For this reason, we give respectful space on our camera Christmas list to the two new print dryers announced by Fedco Products, New York. Both dryers are compact portable units. The Fedco Twin print dryer has two drying surfaces, each measuring 11½ x 15 inches, and will accommodate eight 5 x 7 prints at one time. It uses 200 watts of current and is priced at $10.95. The single print dryer has half as much drying space, uses half as much current, and costs $7.75. The canvas covers can be removed quickly and easily for washing.

Another new gadget is the Apex Multiscope, which can serve half a dozen functions for the hobbyist. It can be used as a daylight viewer, electric viewer, small table projector, sturdy table tripod with a 90-degree tilt for any camera, and as a tilting head for a standard tripod. Manufactured by the Apex Tool and Machine Company, Glendale, California, it is priced at $8.50.

And now, far up the we-wish-we-had ladder, comes the portable photo-bar and the prefabricated darkroom. The former, when closed, looks like a finely finished walnut cabinet suitable for any room in the house. But open and ready for action, it serves as a completely equipped darkroom setup, with clock and safelight on an eye-level shelf, enlarger mounted on a firm base, a paper safe below the easel, a towel rack, box for graduates and thermometer and a built-in drain. All you have to do is supply a dark place in which to use it—and you can roll it anywhere. The photo-bar, designed and manufactured by Joe Heiz of Hi-Standard Manufacturing Corp., Baldwin, L. I., N. Y., sells at $135, list price.

The prefabricated darkroom, complete except for purely photographic equipment, is distributed by Alco Photo Supply Corp., New York City. The outfit, which can be set up in the garage or basement, comes knockdown in five crates and can be assembled in six hours by one man, or in four hours by two men.

The darkroom is completely wired and fitted with plumbing, shelves, dry racks, an eight-foot stainless steel sink and built-in print wash tank, an air filter and space for an exhaust fan. It occupies floor space of approximately eight feet on each side and is seven feet eight inches high. Water connection can be made via garden hose or through permanent pipes. This photographic dreamroom is priced at $495, FOB Hollywood.

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### State Bird Chart

*Woman's Day Magazine*, the A. & P. Stores publication, makes a valuable educational contribution with the publication of a chart in color of "Birds of the States." This is specially illustrated by Fritz Kredel, the birds being superimposed upon a background of a map of the United States. Close to each bird is indication of the State or States that it represents, together with a key showing whether the bird has been accepted by official action, or by popular expression, or whether it is unofficial. There is only one serious slip in the chart, and that is in making the western meadowlark the unofficial State bird of North Dakota. Both the Dakotas, by legislative action in 1943, recognized the ring-necked pheasant as the official avian emblem. Copies of this chart are available at ten cents each from Box PK846, Woman's Day, 19 W. 44th Street, New York 18, N. Y.

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### Medal to Col. Greeley

At the national meeting of the Society of American Foresters in Salt Lake City, Col. William B. Greeley of Seattle, former Chief Forester of the United States, was awarded the Schlich Memorial Medal. This is the highest honor in American forestry, and was established in memory of the late Sir William Schlich by his friends and admirers in the United States and the British Empire.

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# Under the Microscope

By JULIAN D. CORRINGTON

**Photomicrographs of snow crystals by A. W. Bentley, from *Adventures with the Microscope*, courtesy Bausch and Lomb Optical Co.**

## SNOW CRYSTALS

THE subject of crystals usually brings to mind chemistry or mineralogy, but there is one division of this topic that invades the field of meteorology, the science of the weather. When water, the most abundant and important commodity on earth, congeals to a solid, it may take a variety of forms according to surrounding conditions. Thus we may have ice, frost, hail, sleet, rime, glaze, and snow. Of these, frost and snow freeze in such a manner as to produce crystals, including some of the most amazing and beautiful objects on earth—that is, if you own or have the use of a microscope with which to see them effectively.

Snow is actually ice, but is not frozen rain, as is commonly thought. Rather it is vapor condensed at a temperature below the freezing point. This form of ice, instead of congealing from a body of water, as when a pond freezes over, is produced when exceedingly minute and separate droplets of water in the atmosphere freeze while condensing and make tiny ice crystals. Some of these, especially at first, may appear more or less transparent, but generally seem completely opaque and white because of the reflection of light from their many facets.

If snow crystals form at great altitudes, as twenty to thirty thousand feet, they make up cirrus clouds, the principal type of very high, fleecy, transparent cloud. When the condensation occurs at lower altitudes, the flakes fall slowly and softly to earth or drive down swiftly on strong winds. In the first case, they generally coalesce into large feathery masses and make a deep, soft blanket over all earthly objects; in the second case, they form small, hard pellets that soon compact into ground ice and make the going slippery and dangerous.

Snow crystals are always hexagonal and the more complex types are feathered or branched, as seen in the accompanying illustrations, into compound variations of the six-branched theme in an unbelievable array of beautiful forms. Hundreds of thousands of individual snow crystals have been observed, but the startling fact seems to be well established that no two of them have ever been found exactly alike! Perhaps nowhere else can the inexhaustible variety of Nature be demonstrated in so striking a manner.

Usually snow crystals are deformed by uniting with one another into a matted mass, or by partial melting on passing through a layer of warm air as they fall, or by being broken by wind or impact. Occasionally a perfect specimen grows without interference, like a salt crystal in a slowly evaporating solution, and manages to reach the earth in a perfect state. The longer it has a chance to grow, while forming, the more intricate the design. It is these rare, elaborate, and perfect specimens that reward the patient search of the microscopist with all the satisfaction of discovering a flawless and exquisite gem.

The outstanding and almost sole authority on the architecture of the snow crystal was the late Wilson A. Bentley, of Jericho, Vermont. He wrote widely on the subject, and is known the world over for his many splendid and lovely photomicrographs of these aërial jewels. The examples shown here are from his collection of many thousands. Perhaps you have seen others as adapted in animated cartoon movies, in art craft or metal work, in textile design or jewelry. Actually, the possibilities of appropriating the wonderful and intricate designs of these hexagons have scarcely been touched. For additional examples the reader should consult Bentley's *Snow Crystals,* McGraw-Hill Book Company.

Bentley's instructions for observing and photographing snow crystals begin with the admonition that the operator must possess a large stock of patience. Winters vary a great deal in regard to favorable snow falls, some winters furnishing as many as twelve to fifteen falls suitable for this work, others only four or five, or even none at all. The soft, wet fall at relatively warm temperatures is worthless, as the crystals are melted or matted. Best subjects occur when the thermometer ranges from 24° down to zero, when the fall is medium to scanty, and with westerly to northern winds. They must occur during daylight hours, since artificial illumination for the microscope cannot be used, owing to the heat of the lamp.

The equipment designed by Bentley for this work is very simple to secure or make. He used a board, painted black, and with wire handles, and either caught snow flakes in the air as they fell, or lifted up some fallen snow on a shingle and brushed a few flakes on the board with a feather. Flakes on the board are then quickly examined with a hand lens to see if desirable examples are present and, if so, the board is then carried into a room where the temperature is as cold as outdoors. In this inspection, as well as in all subsequent operations, it is very important to make sure that all items used, as boards, splints, feathers, and blank microscope slides are as cold as the outdoor temperature, and that the breath is not at any time directed toward the flakes; the warmth of the breath is speedily fatal to these fragile crystals.

Suitable shelters for this work include unheated outbuildings, as a garage or shed, or other structure. The microscope is set up in advance, using a table placed close to a door or window, with the mirror obtaining light from the sky or a snowbank. Bentley preferred the horizontal arrangement of

microscope and camera, but the vertical is equally good, depending on the type of equipment available. He also used his microscope without an eyepiece, for photomicrographic purposes, since the magnifications wanted are low, ranging from 8X to 60X. For visual observations the eyepiece is, of course, essential; have the microscope in vertical position and choose the optical combination that will give magnifications in this range, if possible. For example, use the low power (16 mm, 10X) objective and a 5X ocular, giving a final magnification of 50X; or remove the front combination of this objective, the remaining rear element then being a 32 mm, 4X objective. When employed with a 10X eyepiece, the final enlargement is 40X.

With all items in readiness, the evanescent snow flakes may now be captured and rapidly transferred to a slide. Press the side or point of a sharp wooden splint very gently and cautiously upon a snow flake until it adheres, then hold this splint over a very clean microscope slide and jar the splint so that the flake falls on the slide. Press the flake gently with a feather so that it will henceforth stick to the slide. Work fast and arrange three or four flakes side by side on the same slide. This completes the work for visual observation.

For photography, which involves the real thrill of recording these jewels permanently, mount the slide on the microscope stage and secure a sharp focus on the camera ground glass. Hold a black card in front of the objective, remove slide of plate holder of camera, and make the exposure by removing the card for the desired interval. Then replace card, replace slide of plate holder, and breathe freely for the first time, hoping that you secured a good negative.

Not much information can be given as to length of exposure, since there are so many variables involved—type of microscope, lenses, magnification used; type of camera; whether fixed-focus or with bellows extension; type and speed of plate or film; and most of all the quality of the light available, whether the day is somewhat dark, or medium, or quite bright. Here, an exposure meter is very helpful. Only experience will tell, using the trial and error method. Start with a ten-second exposure, full aperture, then take successive pictures at ten-second intervals up to sixty seconds. Make careful notes as to all conditions. After the first batch of pictures has been developed, you will then have certain data to guide future efforts.

Frost pictures, made from the window pane, present less of a problem. As these fairy scrolls will remain for hours if the day continues cold, the element of hurry is lacking. The main essential will be a certain ingenuity in rigging up a shelf or bracket support for the camera and microscope.

Frost is precipitated when the dew point is accompanied by low temperatures. It is not frozen dew, as many think, but a form of ice, the solid form of vapor condensation at or below freezing temperature. The crystals will grow and increase, tracing lacy patterns of great beauty and complexity. Here is an inexhaustible field for the microscopist who is willing to work in heavy clothing and muffler, and who cares not for cold ears and fingers so long as he captures that exquisite portrait of Jack Frost or the Snow Maiden.

---

## HISTORICAL OUTLINE

After the broad fundamentals had been laid down in bacteriology, advances in description of types and recognition of principles came rapidly. Some of the chief personalities and discoveries concerning the major human pathogens can best be summarized chronologically.

1872—Hansen discovered *Mycobacterium leprae,* etiological (causal) agent of leprosy. This was one of the earliest studies linking a specific organism with a human disease, yet leprosy remains today one of the least understood of serious ailments.

1879—Neisser found the microbe that causes gonorrhea. The gonococcus is now usually named *Neisseria gonorrheae,* type species of the family *Neisseriaceae,* in his honor.

1880—Pasteur demonstrated the presence of staphylococci in pus.

1880—Eberth examined glands and spleen of patients dying of typhoid fever and discovered the typhoid bacillus, now named *Eberthella typhosa.*

1881—Ogston proved the pathologic nature of both staphylococci and streptococci.

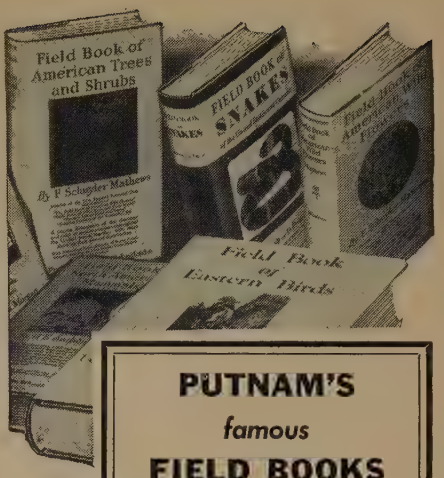
1882—Robert Koch not only demonstrated the tubercle bacillus, *Mycobacterium tuberculosis,* by special staining methods, as previously recounted, but also isolated this species, grew it in pure culture, and reproduced the disease by inoculating the germs.

1883—Edwin Klebs, German pathologist, discovered the diphtheria bacillus, today termed *Corynebacterium diphtheriae.* Another genus, *Klebsiella,* commemorates his labors in bacteriology.

1883—Discovery of the cholera organism, *Vibrio comma,* by Koch.

1884—F. J. S. Löffler (or Loeffler) isolated and studied the diphtheria pathogen. He was unwilling to associate this species directly with the disease, as the evidence was not conclusive at this time. He also invented his serum medium for cultivating this bacillus, and perfected the methylene blue stain that bears his name and finds so much use today.

1884—Gaffky isolated and grew typhoid bacilli on culture media. Another form that he discovered, *Gaffkya tetragena,* was named for him.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1884—Nicolaier found the tetanus bacillus, *Clostridium tetani.*

1885—Bumm isolated the gonococcus, made pure cultures, and proved the casual relation with the disease by successful inoculation of human volunteers.

1886—Fränkel (or Fraenkel) discovered the pneumococcus, now termed *Diplococcus pneumoniae.*

1887—Weichselbaum isolated and studied the meningococcus, etiological agent of epidemic cerebrospinal meningitis, now designated as *Neisseria intracellularis* or *N. meningitidis.*

1888—Emile Roux and Alexandre Yersin, French bacteriologists and pupils of Pasteur, discovered the toxin (poison) of the diphtheria bacillus. It had been suspected for a number of years that at least some bacteria produce their damage in the body not by direct attack on the tissues but by the release of poisonous excretions. This was the first proof for this vastly important generalization. These two workers showed that the soluble toxin alone, without the presence of the organisms, would produce the symptoms and lesions of the disease.

1889—Shibamiro Kitasato, Japanese student under Koch, isolated the tetanus organism and proved its relation to the disease. In this same year he also observed that the cholera bacillus survived longer when dried in a desiccator than when dried in air, a discovery that became a principle.

1890—Emil von Behring, pupil of Koch and later professor at Marburg, collaborated with Kitasato in a work that Frobisher refers to as "possibly the greatest single discovery in human history." This research team demonstrated that patients ill with diphtheria or tetanus produce an antitoxin which neutralizes the toxin, in either case, and that the blood serum of these patients exerts a curative effect when injected into others in the early stages of these diseases and who have not yet had time to manufacture their own antibodies. This work laid the foundation for antitoxic therapy, now a cornerstone of modern medicine.

1892—Iwanowski opened up the ultramicroscopic world of pathogens when he discovered the tobacco-mosaic virus. Many other virus diseases were soon identified and studied.

1894—Kitasato and Yersin, independently and almost simultaneously, discovered the plague bacillus, *Pasteurella pestis,* one of the greatest killers in all history.

1896—van Ermengem isolated *Clostridium botulinum,* causal organism of the dreaded botulinus preserved-food poisoning.

1898—Another Japanese scientist, Shiga, described the first of numerous dysentery bacilli, *Shigella dysenteriae.*

1898—Bordet, Belgian bacteriologist, began a long series of researches on antibodies and immune phenomena.

1900—Walter Reed and others of the American Army Commission worked out the elusive details of yellow fever, a virus disease transmitted by mosquitoes.

1901—Bordet produced his complement-fixation principle.

1901—Elie Metchnikoff (or Ilja Metschnikoff) announced his discovery of phagocytosis of bacteria by white blood corpuscles.

1903—Metchnikoff and Roux succeeded in transmitting syphilis to monkeys and apes.

1904—Paul Ehrlich published the first of his many important contributions on the side-chain or receptor theory of immunity.

1905—Schaudinn and Hoffmann described the spirochete, *Treponema pallidum,* causal organism of syphilis.

1906—Wasserman perfected his complement-fixation test for syphilis. Today there are many others, as the Widal (typhoid), Kahn (syphilis), Schick (diphtheria), and Dick (scarlet fever).

1911—Noguchi, Japanese bacteriologist, succeeded with a problem of great difficulty, the growing of pure cultures of the syphilis spirochete.

1915—Twort discovered a living agent that destroys bacteria and which has been named bacteriophage, or more recently, simply *phage.* Many workers now consider phage to be a virus disease of bacteria.

1917—d'Herelle also discovered phage and has done the most important work on this subject, now generally termed the Twort-d'Herelle phenomenon. Phage attacking bacteria have been shown by the electron microscope.

1935—Stanley isolated the tobacco-mosaic virus and prepared it in pure crystalline form. He found it to consist entirely of protein and that repeated recrystallization failed to alter its infectivity. This work brings in highly important concepts in general biology, for a crystal is a chemical entity, with a definite formula, yet these crystals are capable of multiplying in a host body, a phenomenon restricted to living organisms. This virus has recently been micrographed with the electron microscope.

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**The annual index to each volume of Nature Magazine is prepared with great care, with the purpose of making a year's issue of the magazine useful and valuable as a source of natural history reference. A cumulative, ten-year index to the first ten years of Nature Magazine is available, but none has as yet been compiled for the second ten years, owing to the considerable expense involved in the preparation and publication of such an index, which would require more pages than are found in a single issue of the magazine. However, the annual indexes should suffice to meet most needs.**

# INDEX TO NATURE MAGAZINE

## January-December, 1946

(*Gen.* indicates a general article; *fig.*, a photograph or drawing; *rev.*, a review; *port.*, a portrait.)

NOTE: In error, pages 313 to 316 are repeated. Entries in the duplicated pagination are indicated thus—313 bis.


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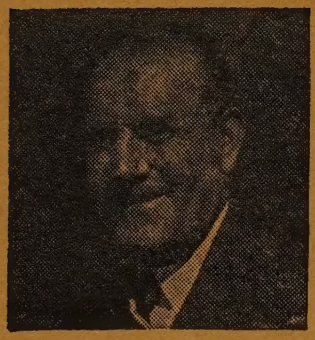

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